Growing Up in a One-Parent Family: The Influence of Family Structure on Child Outcomes

Carmel Hannan, Brendan Halpin and Carol Coleman

Department of Sociology University of Limerick

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Family Support Agency

sociology UNIVERSITY OF LIMERICK

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A Report for the Family Support Agency

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Available to download from the Family Support Agency website

The Authors

Dr Carmel Hannan and Dr Brendan Halpin are lecturers at the Department of Sociology, University of Limerick. Carol Coleman worked on this study as a research assistant in the Department of Sociology, University of Limerick.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The Research Question

The purpose of this report is to investigate the known correlation between non-traditional family structures and poor outcomes for children.

Discussions of this topic often focus on the distinction between two-parent families and one-parent families but this distinction can be misleading. In the Irish case, the *crucial* distinction is between children raised by parents who are married and children raised by a lone-parent who has never been married. The focal point here is *non-marriage.*

This is important since non-marriage appears to be highly selective because the least privileged groups in Irish society are more likely to have children outside of marriage and at a relatively early age.

This argument suggests that selection bias accounts for much of the association between family structure and child outcome i.e. growing up in a non-traditional family has little 'direct' or 'causal' effect on a child's outcome. A large body of literature exists which documents a correlation between non-traditional family structure and poorer child development but researchers disagree as to whether this association represents a true causal effect.

The primary objective of the current study, therefore, is to test this selection argument and to examine the extent to which selection effects can account for differences in child wellbeing in various family types.

The Data

The current study is based on the first wave of data on the child cohort (9 year olds) in the *Growing Up in Ireland* (GUI) survey (2008). It examines family structures and their associations with child wellbeing in the case of 9 nine year olds. The analysis can be grouped under four main themes:

- The structure of families in the GUI data
- The selective nature of family formation
- The role of selection effects in explaining differences in child outcomes
- The role of other factors in explaining these differences.

Methodology: Propensity Score Matching

In the current study, we use propensity score matching to match children in non-traditional families ('treatment' groups) to children in married two-parent families ('control' group), based on the propensity to be in a non-traditional family. In other words, the current study identifies similar children and determines how a specific outcome might be affected had the child's parents married or remained married.

We compare various child outcomes between treatment and control groups using semi-parametric estimators. This method allows us to address the role of selection bias in understanding differences in child development.

Main Findings

Family Structure

The current study categorised families according to their current living situation and their marital status. Using the GUI data (and taking into account the quantity of respondents in each category) four main family types were employed in the analysis:

- Married two-parent families
- Cohabiting two-parent families
- Never-married one-parent families
- Previously married one-parent families.

In most cases the child's primary caregiver is the mother. Therefore, the main models in this report refer to the mother's characteristics.

The Selective Nature of Family Formation

The argument assessed in the current study maintains that childbearing outside of marriage does not necessarily lead to poor child outcomes. The majority of mothers who give birth outside of marriage come from impoverished backgrounds and, therefore, the adverse consequences of childbearing may be due to pre-existing socio-economic disadvantages.

The current report sets out to assess the ways in which three categories of mothers ('cohabiting', 'never-married' and 'previously-married') might differ systematically from married mothers (the control group).

The results confirm that childbearing outside of marriage occurs non-randomly. In other words, certain factors – such as the mother's age and her socio-economic status – mean that children do not randomly end up in certain family types.

The main findings with regard to mothers are:

- Marriage was most common among older, more educated and more religious mothers
- Never-married lone-mothers tend to be younger: more than half of all unmarried mothers (58.5%) were less than 25 years old when they had their child compared to only 13% of married mothers
- Cohabiting mothers tend to be younger, are less educated and tend to be less religious and spiritual. For example 18% stated they had no religious affiliation compared to 7% of married mothers
- Previously-married lone-mothers have more in common with married mothers but they are less likely to be Irish citizens and state Catholicism as their main religion when compared to married mothers.

The mother's socio-economic background has important influences on child development. In that regard, the main findings are:

- 13% of married mothers smoked while pregnant compared to twice that number of cohabiting or previously-married lone-mothers and almost a third of all never-married lone-mothers smoked while pregnant
- Rates of chronic illness prior to childbirth are higher among lone-mothers: one in five separated lone-mothers reported a history of chronic illness compared to one in 20 married mothers
- Cohabiting mothers are most likely to come from impoverished backgrounds with 17% reporting that their family of origin had great difficulty making ends meet when they were 16. This compares to 13% of previously-married lone-mothers and 9% of married mothers
- The lowest propensity to breastfeed (one in three) was found among mothers who never married (be they cohabiting-mothers or lone-mothers) compared to almost half (47%) of married mothers.

Drawing causal conclusions and making policy recommendations based on these basic comparisons is difficult. Sophisticated statistical methods can be used to take account of these selection effects and, in turn, to develop effective policies to address the consequences of growing up in non-traditional families. However, even with such statistical methods, evaluating the 'true' causal effect of family structure remains an elusive goal.

The Effects of Family Structure on Child Outcomes

Propensity score matching techniques are used to adjust for selection bias and to assess the effect of family structure on child outcomes related to: health, psychological wellbeing and educational development. After adjusting for selection bias, the variable most affected by growing up in a non-traditional family appears to be educational attainment. The effects vary depending on the type of family the child belongs to. In summary:

- Children from cohabiting families scored, on average, 10.6% less in the reading test than children with married parents but most (75%) of the negative effect is due to differential selection into these family types
- Children from never-married one-parent families scored almost 11% less on the maths test when compared to children with married parents. Much of this difference (52%) is the result of pre-existing disadvantages
- Differences in school attendance are also much smaller once selection into family types is taken into account but despite the reduction in the size of the differentials, children in non-traditional family types score lower on the range of educational outcomes.

In general, smaller negative effects were found in relation to the physical health and emotional wellbeing of children from non-traditional families when compared to the effects in the area of education. The key findings are:

- Children with cohabiting parents scored slightly higher on the BMI index but the difference is the result of pre-existing disadvantages
- Children with previously-married lone-mothers were slightly more likely to have spent time in hospital as an inpatient compared to children from married two-parent families but the difference was due to the differential selection into these family types
- Children in non-traditional family structures were more likely to report a negative self-concept - where a negative self-concept is associated with fear, apathy, anxiety, and insecurity. Children from these families scored lower in this regard, however, because of the differential selection into marriage compared to all other family states

The matching results suggest that when faced with similarly adverse conditions growing up, children from one-parent families and cohabiting families fare similarly in most regards to children from families of married parents. However, some differences do remain, especially in terms of maths scores and school attendance among children from never-married one-parent families. This is most likely the result of bias caused by factors not taken into account in the analysis.

Beyond Selection Effects

School Context

School context was found to have a significant effect on child outcomes. Disadvantaged schools have an over-representation of children from never-married one-parent families and cohabiting families. Urban Band 1 schools (the most deprived schools) have the most varied students. Less than half of all children in these schools live with married parents, 15% live with cohabiting parents and over a fifth live with a never-married lone-parent. This contrasts strikingly with non-disadvantaged schools where 80% of the students come from married two-parent families.

These school factors and their associated neighbourhood effects are important in understanding differences in the educational development of children but they have not been addressed in the current study. They will, however, be the subjects of a future FSA-funded study in this area.

Income

Income is one of the most powerful predictors of disadvantaged childhoods but a measure of previous earnings, reflecting the role of selection effects, was not available in the GUI study. The study collected data on current income and, as expected, it had a significant effect on all the child outcomes in the current study. An initial analysis revealed that cohabiting families were reporting an equivalised household annual income of over €4,000 less than married families. The propensity score matching estimate is over 90% smaller so that this income differential was almost entirely related to the differing socio-economic profiles of these families.

Selection bias, however, explained little of the difference in incomes between one-parent and two-parent families. The matching estimates for previously married one-parent families were €4,500 less and never-married one-parent families €4,700 less than their married counterparts.

Material wealth does not necessarily reflect the social quality of family life. In terms of the work/family life balance, variations were evident across all families. Despite lower income levels, for example, children from never-married one-parent families were most likely to go on regular outings together as a family.

Policy Implications

This report's findings have a broad range of policy implications, not least in presenting a more complex picture of the effects of lone-motherhood on child development. Therefore, policy makers can be informed of the scale of the effects across a range of child outcomes as well as the likely effects of selection bias. Some implications for specific policy areas are highlighted but, in the main, the results indicate the importance of a more holistic approach to tackling issues of child wellbeing.

One of the key findings from the current study is that the majority of never-married lone-mothers and cohabiting mothers are younger and come from impoverished backgrounds with lower levels of educational attainment. The limited educational and work opportunities afforded to these young women, in turn, impacts on child development and points to a cycle of deprivation.

- The major finding of the current study, as it relates to policy, is that once socio-economic background differences are taken into account, the association between negative child out comes and living in a one-parent or cohabiting family is substantially reduced.
- The apparent benefits to marriage as they relate to child development appear not related to marriage per se but to the background characteristics of those who marry.
- The implication is that family structure does not have a major direct influence on child out comes. A move towards a welfare system – which supports families on the basis of low educational attainment, poor employment prospects and low levels of income rather than the residential status of the parent – is one implication of this research.
- Another implication relates to the child's educational development and the longer term issue of continual family disadvantage across generations.
- The area most negatively affected by lone-parenthood and cohabitation is the child's educational development, particularly in relation to maths scores. Despite controlling for school context and confounding factors, children from never-married one-parent families scored significantly lower on the maths test, even at this early age.
- One implication of this is the need for learning support/resource teachers to target maths skills within all schools but, in particular, within the most disadvantaged schools.

Limitations

The impact of family type on child development can only be properly assessed over a longer period of time. The matching exercise that we used has several limitations due to the lack of longitudinal data. Propensity score matching results generally show that traditional regression methods overestimate the negative effects of lone-motherhood, although this was not the case in the present study. The analysis was undertaken in order to establish best practise in the field of family research. As these children are followed over time, the use of sophisticated statistical techniques such as propensity score matching will become more important and necessary.

The effect differences stated in this report were found to be vulnerable to unobserved confounding variables or hidden bias. It would be extremely beneficial, therefore, if, retrospectively, more information was collected from the mothers about their backgrounds, especially dates of marriage and employment circumstances prior to the birth of the child.

Recommendations

As longitudinal data from the GUI study become available, establishing best practise – in terms of handling attrition, unobserved bias and missing values – will become increasingly important. GUI data workshops, data seminars and graduate research methods schools are important in order to ensure that best practice is established in this area and to equip researchers with the necessary skills required to analyse such data. The potential for innovative mixed methods research should also be encouraged given the wide array of data collected in the GUI study.

Chapter 1 – Introduction

1.1 Background

The influence of family structure on child development has been a topic of research for several decades. In its simplest form, it is the comparison between two-parent and one-parent families and how such family structures relate to a child's wellbeing. In most studies, children who live with two married parents are defined as living in two-parent families, whereas children who live with just one biological parent – due to death, marital breakdown or non-marriage – are considered to live in one-parent families. However, the issue is much more complex and trends in family structure over recent decades make it increasingly necessary to specify more precisely the relationship between children and parents in order to understand the implications for child wellbeing.

The consequences of family structure on children's development are of interest to parents, practitioners, policy makers and social scientists. Paying serious attention to the influence of family structure on academic and social development is critical because the number of children in one-parent families continues to increase. Between the 1986 and 2011 Census of Population in Ireland, the number of one-parent families almost tripled so that by 2011, 24.8% of all families were one-parent families. In addition, in the first quarter of 2011, Ireland witnessed the greatest number of births since records began in 1960. In that quarter, 34% of all births were registered as outside of marriage (CSO 2012). Given this increase, the consequences of growing up in differing family structures for children's development is of crucial importance.

The sources of the growth in one-parent families are well documented (Fahey and Russell 2001). Up to the 1990s there had been a dramatic rise in the proportion of births occurring outside of marriage: from 5% in 1980 to 32% in 2000 (Lunn, Fahey, and C. Hannan 2009). There has also been an increase in marital breakdown. Between the 1986 and 2006 census, the total number of people whose marriages had broken down increased five-fold, from 40,000 to just fewer than 200,000. By international standards, however, Ireland has a relatively low rate of marital breakdown so that the dominance of the unmarried route into lone-parenthood appears unusual by international standards (Lunn and Fahey 2011).

It has been argued that differences in life outcomes are largely determined by the characteristics of the family (Cherlin 2001; McLanahan and Sandefur 1994). International empirical evidence suggests that children who grow up living with both biological parents fare better than children who don't (Acock and Demo 1994; Amato and Alan Booth 1997; Amato 2001; Cookston 1999; Flewelling and Bauman 1990; Frisco, Muller, and Frank 2007; Mayer 1997; R. E. McKeown et al. 1997; Patten et al. 1997). A meta-analysis of 92 studies conducted during the 1980s (Amato and Keith 1991) and of 67 studies conducted during the 1990s (Amato 2001), for example, compared the wellbeing of children from divorced and two-parent families and found that children from divorced families had significantly lower scores on a range of outcomes including educational achievement, behaviour, psychological adjustment, self-concept, social competence and long-term health.

Family structure can constrain the availability of economic and social resources such as parents' ability to spend time with their child, be involved in educational activities, and expend monetary resources that can promote positive educational outcomes and wellbeing (Schneider and Coleman 1993). Much of the differences in child outcomes seen across families are, therefore, determined by the characteristics of the families, such as these social and economic resources. In international studies, the estimated negative effects of solo-parenthood appear quite weak – although still statistically significant – once these resource factors are taken into account (Amato 2000; OECD 2009).

1.2 Research Aims

The primary aim of this research is to test the role of selection effects in explaining differences in child outcomes across families. Such an approach places weight on the social and economic resources inherent in families rather than on the living arrangements or marital status of the parent(s) (see Section 2.2). The importance of selection effects is of interest to sociologists and policy makers but the report is not testing any particular social theory, rather it is narrow in scope, focusing on the role of selection factors.

In the Irish case, little is known about the domains in which family structure matters and the magnitude of its effects, be they short- or long-term. No national longitudinal study of children had been carried out in Ireland up until 2008, when the *Growing up in Ireland* (GUI) study began. By using this new information, this report measures the magnitude of the effects of growing up in differing family structures on child development and examines the empirical evidence on the association between family structure and children's educational development, physical health and psychological wellbeing.

The current study addresses several methodological problems associated with many of the international studies. Special attention is paid to the fact that it is difficult to draw causal conclusions about the specific factors through which family structure affects child development.

The specific causal mechanisms through which family structure affects child outcomes are not well understood. While randomised experiments offer the best evidence of causal relationships, such designs are not well suited for studying family structure. For obvious ethical reasons, it is not possible to randomly assign children to different types of families. Researchers interested in investigating family structure have begun to take advantage of promising alternative methods for addressing questions of causality and this report follows in that light by employing the method of propensity score matching.

The main objectives of the current study are to:

- Examine and evaluate the GUI data source for the 9 year old cohort from the perspective of family research (Chapters 2 and 3)
- Compare the socio-economic profile of a range of family structures (Chapter 3)
- Identify the effects of growing up in different family structures on key child outcomes such as educational attainment, health status and emotional wellbeing (Chapter 4)
- Theorise about how family structure influences child wellbeing, in terms of the social and economic resources available to families (the selection argument as presented in Chapter 2)
- Draw conclusions on the main factors influencing child wellbeing across families (Chapters 5 and 6)
- Draw implications for policy, particularly regarding the likely influences on the stability of marriage and the mechanisms that might hinder children's development (Chapter 6)
- Identify key priorities for future research, focusing, in particular, on issues that might be investigated in future waves of the GUI (Chapter 6).

1.3 Family Research within Ireland

The passing of the *Civil Partnership and Certain Rights and Obligations of Cohabitants Act 2010* sparked a muted debate about the welfare of children growing up outside the traditional family i.e. children not living with their married biological parents. The debate mainly centred around the effects of poverty or welfare dependence on child welfare. In the UK, a livelier debate was sparked by the riots in 2011. Much media coverage was given to the moral collapse of British society and the breakdown of the family. But what do we know about one-parent families? More importantly, what is the empirical evidence to support any arguments made about child welfare in the Irish case?

Very little research has been carried out on the effects of family structure on children within Ireland as such work had been hampered by a lack of suitable data. McKeown, Pratschke and Haase (2003) represented the only nationally representative study of family wellbeing undertaken prior to the availability of the GUI study. The GUI study therefore provides an important resource for a national large-scale study of the relationship between family structure and wellbeing. Guided by family systems theory and ecological perspectives about families (Bronfenbrenner 1989), the study collected a wide-range of information about children from a number of perspectives, thus yielding a holistic picture. This research employs only part of the information collected but this report also points to the importance of contextual effects for future studies.

Poverty and deprivation among lone-mothers has been a constant theme in the Irish research carried out to date. With the exception of McKeown (K. McKeown et al. 1998), there has been no sole research on lone-fathers. Data from the EU Survey on Income and Living Conditions (EU-SILC) showed that in 2009, 16.6% of lone-mothers were living in consistent poverty, compared to 5.5% of the population as a whole (Frazer and Devlin 2011). McKeown (2000) found that most lone-fathers, like most single mothers, were a highly disadvantaged group in Irish society and lived close to or below the poverty line – confirmed in a more recent analysis of the 2006 census (Watson 2011).

Another key feature of the literature is its focus on the difficulties experienced by lone-mothers in gaining employment and in accessing appropriate childcare arrangements (Mahon 1998; McCashin 1996). When employed, lone-mothers are over-represented among the low paid and have lower educational qualifications (Fahey and Russell 2001; C. Murphy, Kielty, and Caffrey 2008; Russell 2009). Fahey and Russell (2001) found that lone-mothers were highly concentrated in supported employment e.g. the community employment scheme.

A more recent study found that the vast majority of the 1,600 respondents (84%) who were in receipt of One Parent Family Payment were currently working, looking for work or engaged in education or training (C. Murphy et al. 2008). The lack of affordable quality childcare, however, was listed as a major barrier to participation among lone-parents. From 2012, new participants on community employment schemes cannot claim One Parent Family Payment at the same time, which implies this source of employment will diminish among lone-mothers.

According to Daly and Clavero (2002), policy debates on lone-parenthood have centred around two issues: first the extent to which public policy should encourage or compel lone-parents to be employed and, secondly, the extent to which it should encourage, rather than discourage, joint-parenting. The former issue has received most attention especially recently given the proposal that lone-mothers be required to work if they are moved off the One Parent Family Payment and onto Job Seekers Allowance when their youngest child is 7. The issue of joint-parenting receives less attention.

More general research on family trends has found that the age profile of lone-parents depends very much on their marital status (Cousins 2006). Fahey and Russell (2001) found that most unmarried lone-mothers were younger (aged under 30) while most separated lone-mothers were aged over 35. Both unmarried and separated lone-mothers had considerably lower educational levels than the average for all mothers and were disproportionately drawn from the semi-skilled and unskilled social classes.

In terms of the effects of family structure, McKeown et al. (2003) found that the type of family in which one lives has virtually no impact on family or child wellbeing in their nationally representative sample of 1,500 households. They found that the physical and psychological wellbeing of parents was shaped primarily and directly by personality characteristics, family processes and the socio-economic environment. Taking account of these factors, the particular type of family in which one was living has little or no impact on wellbeing with the important exception of lone-parent families where mothers tended to have lower levels of psychological wellbeing than other parents.

The study also found practically no variation in the wellbeing of children in different family types. They did, however, find that children of married parents had the fewest physical health symptoms and, therefore, the highest level of physical wellbeing whereas children in one-parent separated families had the largest number of physical health symptoms. In addition, children in one-parent single and separated families had a less positive perception of their environment when compared to children in two-parent married families.

The authors concluded that child wellbeing was directly influenced by four factors:

- The presence of unresolved problems between the child and the parents such as behavioural and family issues and personal autonomy
- The characteristics of the mother. Child wellbeing was promoted by the mother's own wellbeing, her supportiveness to the child, her satisfaction with being a parent and her skills in resolving conflicts with her partner
- The father's supportiveness which has implications in terms of policy designed to encourage joint-parenting
- Family income was found to matter as children tended to show fewer signs of psychological disturbance as family income rose (K. McKeown et al. 2003).

Another important contribution to the Irish research was by McCashin (1996) whose research was based on in-depth interviews with 53 women in the Coolock area of Dublin. A central finding was the positive aspirations many of the lone-mothers had towards work, a result echoed in more recent research (C. Murphy et al. 2008). Childcare was seen again as a major barrier to employment among lone-parents themselves (Corcoran and Russell 2000; McCashin 1996; C. Murphy et al. 2008).

The economic boom in Ireland was accompanied by a dramatic increase in female labour market participation so that by 2008 Ireland had exceeded the EU target rate for female employment set at 60%. Employment rates did not, however, increase for lone-mothers – labour market participation among lone-mothers remained at 58% in 1998 and in 2007 (Russell 2009). In 2005, the average employment rate among lone-parents stood at 70.6% for OECD countries. Ireland ranked poorly with 44.9% of lone-parents employed (OECD 2011). In addition, those lone-mothers who work are more likely to be in low-paid jobs, partly as a result of lack of educational qualifications and partly because of the difficulty in accessing affordable childcare (Fahey and Russell 2001; C. Murphy et al. 2008; Russell et al. 2009).

Both McKeown's and McCashin's studies called for a larger national study of the family including the full range of family types (McCashin 1996; K. McKeown et al. 2003). The availability of the GUI data now gives us the opportunity to undertake an accurate and comprehensive assessment of child wellbeing across all families. The current study represents the first steps towards this goal as it compares families in the first wave of the study. In other words, the report examines the progress and wellbeing of children at age 9. In contrast to most previous research, the current study examines all forms of parenthood and is large-scale and statistically representative. Longitudinal data from the GUI study has been collected but was not available to the authors at the time of publication.

Chapter 2 – Family Types and Selection Bias

2.1 The Growing up in Ireland Study

This project draws on the first wave of the *Growing Up in Ireland* (GUI) Child Cohort Study, a large-scale survey of 9 year old children sampled within primary schools in Ireland. The GUI study is an extremely rich data source, incorporating results from questionnaires provided to school principals, teachers, parents and children, as well as time-diaries and some qualitative data. The questionnaire data and information on test scores in reading and maths were used in this report.

The study is made up of just over 8,500 children who were selected randomly through the national school system. A nationally representative sample of 900 schools was selected from all over Ireland, including mainstream national schools, private schools and special needs schools. Over 2,300 individual teachers cooperated with the study in the schools as well as principals and support staff. The sample of 8,568 9 year olds was then randomly selected from within these schools. The response rate at the school level was 82%, with 57% of families agreeing to participate. Statistical weights were developed to ensure that the information presented was representative of all 9 year olds in Ireland (Murray et al. 2011). Detailed information on the design, instruments and procedures used to minimise sample and response bias are available in the technical report of Murray et al. (2011).

To gather as much information as possible about each child, information was collected from the child, his/her parent(s)/guardian(s), school teacher and principal as well as child-minder (where relevant). Some information reported by participants could be subject to bias on their part but this research has looked at responses from numerous participants in order to minimise such bias. Each child was asked to complete a Drumcondra test in reading and maths. This test was administered by a fully trained study researcher (field worker) who visited each school. The child's teacher was asked to complete two short questionnaires: the first about the school and the second about how the child is doing in school. The school principal was also asked to complete a short questionnaire about the school. Again, this information could be subject to bias but provisional analysis has found that reports by the parents, teachers and children match, to a large extent (Rooke 2012).

The study researcher visited the homes of the children. The children and their parent(s)/guardian(s) were asked to fill out separate questionnaires. The parents' questionnaire collected information on a number of themes:

- Household composition
- Child's health
- Child's use of health services
- Child's diet and exercise
- Parent's health
- Parent's lifestyle
- Child's activities
- Child's emotional health and wellbeing
- Child's education
- Family context i.e. socio-demographics and household income.

In most cases, both the primary and secondary caregivers were interviewed. Almost all the primary caregivers (98.7% in the unweighted data) were the biological parent of the child while only 1.2% of primary caregivers were male (unweighted data). Information was also collected on the neighbourhood and community but this contextual information is not analysed in this report.

The child's questionnaire collected information on a number of topics from their family, school, diet, activities, likes/hobbies and community perceptions. Where relevant, permission was requested from the child's primary carer to contact a non-resident parent who was then sent a questionnaire to fill out and return. At the time of writing, about half of the non-resident parents (mostly fathers) returned this questionnaire. As detailed in Fahey et al. (2013), this level of response is too low and open to biases in selection to provide representative coverage so the data provided directly by non-resident fathers was

not included in the models. In most cases, the information employed in the analysis relates to the mother of the child, as primary caregiver, be that in one- or two-parent families. In cases where the child was cared for by a childminder, relative or other carer for more than eight hours per week, permission was sought from the child's primary carer to contact this person who was sent a questionnaire to fill out and return (Murray et al. 2011).

Family Structure

It can be difficult to define family structures because differences in terminology can cause confusion, for example, the use of the terms 'lone-parent', 'single-parent' and 'one-parent'. "Interpreted literally, the concept of lone-parenthood could embrace a wide diversity of family types, ranging from the elderly widow living with a grown-up child to a young unmarried mother living with her infant child" (Fahey and Russell 2001; page 22). In policy terms, however, one-parent families are limited to families where there is a non-cohabiting parent living with dependent children up to the age of 12 (as of 2012).

In making comparisons, researchers often refer to intact/non-intact, traditional/non-traditional or one/two-parent families. The GUI study provides detailed information on the relationship of the child to the adults in the household which, therefore, allows for more detailed types of family structures to be developed. Both parents and children were asked questions about the roles and responsibilities of adults in the family, in order to produce more detailed descriptions of family functioning. As noted by Lunn and Fahey (2011), while there is diversity in family structures, there remains a small number of dominant family types that account for the large majority of families in Ireland as a whole. Many of the less traditional family types are not very common in Ireland (see Table 1.1 Lunn and Fahey, 2011) and this was reflected in the GUI data. Therefore, family relationships had to be specified into more broadly-defined categories than we initially hoped due to the small number of cases in certain family types within the GUI study.

Family structure was firstly characterised in terms of the number of parents in the household but it is an over-simplification to rely on a simple dichotomy between one- and two-parent families, particularly since the paths of entry into parenthood differ in important ways which can influence child development. One- and two-parent families were, therefore, broken down into more detailed categories, depending on the parent's marital status. The family type categories employed here, therefore, reflect different demographic phenomena (non-marital birth rates, divorce/separation rates and death rates), which have different antecedents and different implications for the evolution of the families involved (as described by Fahey and Russell, 2001).

While there are good policy reasons for treating one-parent families as a single group in relation to financial support, the current study distinguishes one-parent family types into a never-married one-parent group and a separated, divorced or widowed one-parent group which thus comprises of previously married parents not living with a partner. Ideally, it would have been useful to look at the widowed and divorced groups as separate family types but the numbers of families involved was too small to allow for this. In terms of two-parent families, the study distinguishes between cohabiting and married parents living together with children. While most of the parents in these groups were the biological parents of the children, a small number of step-families were included in these categories (n = 103 married step-parent families and n = 163 cohabiting step-parent families (see Fahey et al. 2012 for a separate analysis of step-families or Hannan and Halpin forthcoming for an analysis excluding step-families).

Our classification is not ideal. Given the small number of cases in some categories, it was not feasible to further differentiate families based on step, foster or adoptive parents or other carers in the household (see Timonen, Doyle and O'Dwyer 2009 on the issue of grandparents; Thorton and Nixon 2011 for an analysis of step parents and Fahey, Keilthy and Polek 2013 for a different classification using the same data source). Step-families are included with other two-parent families and the small number of families where the father was the primary caregiver can be seen in brackets in Table 1.

Given the small number of lone-fathers, these cases were dropped from the propensity score analysis. In addition, it is important to note some of these 'lone' mothers may not be single as information was not collected on their relationship/dating status. In other words, they may not be living with a partner but may well be receiving various kinds of support from a partner outside the household.

For those children living in separated/divorced or never-married one-parent families, this distinction does not capture how much time or money the non-residing parent spends with his/her child (given a large degree of missing data regarding the non-residing parents as outlined in Fahey et al 2012). In addition, previous smaller scale research has shown that there is a complex relationship between women's lives and their formal marital status so that conventional classifications do not capture many aspects of the previous union (McCashin 1996).

Given these caveats, Table 1 presents a breakdown of the various families in the GUI study, classified by whether the primary caregiver was living with a partner and their current marital status. The primary caregiver, in more than 99% of cases, was the biological mother of the child. It is clear that the vast majority of 9 year olds are living with married parents in the one household (81.8% in the raw data). There are a small number of children living in reformed two-parent families where the primary caregiver re-partnered after a separation (0.77% of cases), divorce (0.43%) or the death of a partner (0.06%).

Cohabitation

In the GUI study, cohabitation is self-defined i.e. the information comes from respondents' descriptions of relationships with others in the household. There is very little known about the nature of cohabitation in Ireland. Therefore, the ability to distinguish between cohabitating-parent families and other family types is an important development. The different consequences of growing up in other types of families are obscured when cohabiting-parent families and married parents are included in the same category. In terms of the current study, contrasts were drawn between the married group (who represent the control group) and every other type of two-parent family. This other type of two-parent family is defined as 'cohabiting couples' but their circumstances vary.

In the GUI study, 4.6% of children are growing up with cohabiting parents who have not been married before. Little is known about cohabitation in Ireland but in the 2006 Census, 5% of all children were living with a cohabiting couple (CSO 2007). A study which focused exclusively on cohabiting couples found that within seven years, 75% of cohabiting couples had either separated or married (*O'Donoghue and Halpin 2005*). In other words, the cohabitees with children who appear in the GUI study represent a minority of cohabitees as cohabitation appears more common among younger couples without children (Lunn et al. 2009).

The cohabiting group, as outlined in grey in *Table 1,* consists of a diversity of family circumstances. Most families in this cohabiting group were never-married parents (70%) but parents (mostly mothers) who are separated, divorced, widowed or have an unknown marital status but who have re-partnered are also included in this group. In other words, some of the children in this cohabiting group are adjusting to living with their mother's new partner – a small number were living with a step-father.[1] 158 primary caregivers could not be classified to a family type due to some missing information on the primary caregiver's marital status. In these cases, family type was assessed based on the answers given by the secondary caregiver to the partnership and marital status questions. That left 66 unclassified families (as shown in *Table 1*) but in all 66 cases the primary caregiver was living with a partner but of unknown previous/current marital status.[2] Hence, these cases were grouped with cohabiting families.

[1] There are a higher proportion of step-families in this data (3.3%) when compared to the census in 2006. (See Fahey, Keilthy and Polek 2013)
[2] The decision to use information from the secondary caregiver means that the results have fewer cases of missing data on family type when compared to studies such as Fahey, Keilthy and Polek 2013.

Table 1: *Family Types in the Growing up in Ireland Child Cohort Study*

Family Type Primary Caregiver	Numbers	%	Weighted %
Missing Marital Status	66 (<10)	0.77	0.9
NO PARTNER			
Separated	331 (15)	3.86	5.77
Divorced	109 (<10)	1.27	1.72
Widowed	50 (<10)	0.58	1.06
Never Married	502 (19)	5.86	9.60
PARTNERED			
Married (Control group)	7005 (49)	81.76	75.63
Separated	66 (<10)	0.77	0.57
Divorced	37 (<10)	0.43	0.35
Widowed	5 (<10)	0.06	0.05
Never Married	397 (<10)	4.63	4.37
Total	**8568 (103)**	**100**	**100**

Source: Growing up in Ireland Child Cohort, RMF.

Table 1 Notes

- Children in the care of step-parents, lone-fathers, grandparents, foster parents or other relatives are included here based on their caregivers' current marital status and living arrangements
- Information is also included (in brackets) where the primary caregiver was male. The number of lone-father families in the sample is too small (n=45) to examine separately so they are excluded from the propensity score models using the matched data
- Where the marital status of the primary caregiver was missing, information was included from the secondary caregiver
- *Index of Colour coding:*
  Control group of married parents.
  Cohabiting parents.
  Never-married one-parent family.
  Previously-married one-parent family.

One-Parent Families

Overall, just over 1 in 10 children (11.6% of the 9 year olds) in the study lived with one parent but the circumstances of these families differed greatly. About half of the 9-years-olds in one-parent families were living with a never-married parent (see Table 1). A smaller proportion of one-parent families were the result of marital separation and even smaller proportions were the result of divorce or widowhood. This does not accurately reflect the national picture. In the 2006 census, 18% of all families were one-parent families, which implies that the study under-represents one-parent families. In addition, the study failed to capture the experiences of lone-fathers as there were over 10,000 lone-fathers in the 2006 census (compared to a total of 45 lone-fathers in Table 1).

Using weights developed by the GUI team, it was possible to adjust the sample data to reflect the population estimates and a different overall picture was evident (see the final column in Table 1). This weighted data reveals that just over 18% of 9 year olds live with one parent. Even in the weighted data, however, some of the family categories are quite small, most especially in relation to the divorced and widowed categories.

One-parent families were classified into a never-married group (representing half of all one-parent families) and those who had experienced a marital breakdown or the death of a partner. Ideally, it would have been insightful to keep the family types separate so as, for example, to assess the varying effects of widowhood compared to marital breakdown on child development. Given the small numbers of divorcees and widows, this would have made comparisons difficult once you take other factors into account and, thereby, threatened to identify some respondents to the survey.

The widowed group are, however, of interest in themselves. Widowhood is, of course, much more common at older ages and, in this sample, the widowed group of lone-parents are older than the average: the average age of the primary caregiver in the sample was 39 years as opposed to the widowed group who had a weighted average age of 46. As a consequence of their older age, they also tend to have more children to care for: the average family size in one-parent families was 2.3 compared to 2.9 for widows. This group had, however, higher household income levels: the average equivalised annual income for a one-parent family was €14,547 compared to €21,436 for widowed lone-parents. This group is also represented by a higher proportion of lone-fathers (16% were widowers in Table 1), higher educational levels and widows are more likely to be claiming more than one social welfare payment when compared to the other lone-parent categories.

The divorced group are also of interest given the selective nature of divorce in Ireland (Fahey 2012). Among Irish nationals, most marital separations do not proceed to divorce and, where divorce is granted, it is more common among higher earning women (Lunn et al. 2009). Marital separation and divorce are more common among women who marry at a young age (unfortunately the GUI did not collect information on age at marriage). More generally, the age of a woman at childbirth is a strong predictor of family circumstances. In the GUI data, most never-married mothers (58%) in one-parent families were under age 25 at childbirth compared to 13% of mothers in married two-parent families.[3] Given the small numbers of widows and divorcees, the married, separated and widowed one-parent families were combined to form a previously married one-parent family category (these family types are summarised in Table 2).[4]

[3] Age of mother at first birth was not included here because information on children who have left the household was not collected.

[4] Propensity score matching techniques can deal with small numbers within a treatment group but, in this case, the numbers were too small to allow generalisations to be made.

Table 2: *Family type Classification by detailed marital composition*

Two parents	Includes:	One-parent	Includes:
Married (75.63%)	Married	Never-Married (9.6%)	Never-Married
Cohabiting (6.24%)	Separated	Previously-married (8.55%)	Separated
	Divorced		Divorced
	Widowed		Widowed
	Never-Married		
	Undefined		

Source: Weighted Data GUI Child Cohort, wave 1

2.2 The Importance of Selection

There is little agreement as to why variations in child development occur across family types. The main theoretical arguments entail resource depletion, stress proliferation and interpersonal skills deficits (Amato 1996; Barrett and Turner 2005; McLanahan and Sandefur 1994; Popenoe 1996). Essentially, children whose parents divorce, or never get married, will have fewer resources, more stressors and less interpersonal skills, leading to poorer outcomes in adolescence and young adulthood. It is possible, however, that marital dissolution is rather inconsequential. In fact, the empirical evidence on the differences in adolescent and young adult outcomes across family types may result in a large part, or entirely, from selection bias.

The selection view of unmarried lone-mothers maintains that unmarried childbearing does not necessarily cause negative effects for children. The majority of unmarried mothers in Ireland are younger and come from impoverished backgrounds so that the adverse consequences of unmarried motherhood may be an artefact of the pre-existing socio-economic disadvantages of these mothers. As outlined by Fahey and Layte (in Fahey, Russell, and Whelan 2008), such behaviour may be viewed as a culturally rational response to poverty and limited educational/work opportunities.

Almost all previous research on the effects of family structure on child outcomes is negatively affected by this problem of selection. Factors that predict selection into a particular family type also predict the child outcomes of interest. Previous research in Ireland, as well as a lot of international work, has not adequately assessed and/or adjusted for selection bias. Unmarried childbearing occurs non-randomly as it is concentrated among disadvantaged groups. The current study uses propensity score matching techniques to adjust for selection. This allows us to estimate the effects of family type on a diverse array of child outcomes before and after taking account of selection bias. It also allows us to pinpoint the child outcomes most susceptible to selection bias.

Selection is present when factors that categorise individuals into particular groups (e.g. certain family types) also influence the dependent variable of interest (in this case a child outcome like a maths test score). The factors that increase the likelihood of parental separation, for example, also increase the likelihood of emotional distress among children whose parents separate, which would affect their exam scores. These factors are referred to as confounding factors i.e. variables that affect both the probability of selection into a group and the outcome of interest.

Several socio-demographic characteristics like social class, parental characteristics such as employment status, and couple attributes such as age at first marriage are known predictors of marital stability (Amato and Previti 2003; Call and Nonnemaker 1999; Kowaleski-Jones and Dunifon 2006; White 1990). Some studies have compared child outcomes before and after the separation of their parents (Cherlin et al. 1991), while others use a variety of innovative approaches to address the issue of selection bias.[5] Studies of this nature have highlighted a wide range of selection factors which influence child outcomes and reflect the pre-existing disadvantage of the family, such as:
measures of:

- Parental conflict
- Employment levels
- Educational experience
- Parental smoking and drinking habits
- Religion

(See Lee 2010 for a wide range of confounding factors).

An experimental design with randomisation is an ideal way of balancing out these selection factors, but it is not feasible or ethical to assign children randomly to certain family types. Within non-experimental survey research, the dominant approach to addressing selection bias is to statistically control for confounding factors. Propensity score matching methods, however, have several advantages over statistical control. First, propensity score matching methods produce less biased and more efficient estimates (Heckman, Hidehiko, and P. Todd 1998; Rosenbaum and Rubin 1983). Secondly, propensity score matching can even out disproportionate population groups. In other words, propensity score matching is best utilised when one or more of the study groups is relatively rare and where pre-determined variables differ significantly across these groups (H. L. Smith 1997). Both conditions apply to the current study (as outlined in the next section).

Finally, propensity score matching techniques allow us to disentangle the effects of prior status from current status (J. A. Smith and P. E. Todd, 2001). In the current study, prior status refers to circumstances before the child outcome of interest was measured. Removing the effects of prior circumstances allows for an investigation of the underlying mechanisms that lead to differences in current status outcomes between children whose parents separate, for example, and those whose parents remain married. In the Irish case, this is hampered by the fact that the longitudinal data on the child cohort study was not available. Therefore, this research represents an important bench-marking exercise. The true value of such an approach is apparent where longitudinal data is employed (Lee, 2010; Noel and Falci, 2009).

2.3 Propensity Score Analysis

Propensity score matching methods use an estimate of the counterfactual group to adjust for selection bias (Rosenbaum and Rubin 1983). In order to reduce the bias of confounding factors, we need to know the answer to the counterfactual question, such as what level of an outcome would a child have gained had their parents married? By definition, the counterfactual cannot be empirically observed. However, it is possible to estimate the counterfactual by matching cases that are similar on confounding factors but differ on the focal independent variable (i.e. family type).

Cases are matched on multiple confounding factors, usually between two groups: a treatment group and a control group. This follows from the rationale behind experiments. In an experiment there would typically be two groups, who are both identical by randomisation except that one group is exposed to a treatment. The idea is that both groups differ only in their exposure to this treatment and, therefore, any difference in outcomes can be related to that treatment.

[5] They include within-family fixed-effect models, instrumental variables methods and quasi-natural experimental approaches (see Francesconi, Jenkins and Siedler, 2010 for a comparison of these models).

One could imagine that two children are matched on the same pre-existing characteristics, one of whom is living in a one-parent family and the other in a two-parent family. Matching can, in principle, be done on a range of variables, but the more variables available, the more difficult it becomes to find a matched child. Instead, matching is carried out on the propensity score, which reflects the probability of receiving treatment assignment (see Rosenbaum and Rubin, 1983). In principle, it is sufficient to match children in one-parent families with those in two-parent families who have the same estimated probability of being in a one-parent family but who are, in fact, living with two parents. The predicted probabilities of receiving the treatment are calculated from a logit (or probit) model which serves to match the treatment and control groups based on pre-existing observed covariates i.e. the confounding variables.

The analysis, therefore, entails a number of steps. First, logit models are estimated to calculate the predicted probabilities of growing up in the various family types, which are used as the propensity scores. In these models, all observed covariates are measured prior to the outcome being measured or are fixed over time in order to minimise reverse causality. Measures such as current household income cannot therefore be employed as confounding variables. The next chapter outlines the observed covariates used in this regard (a variety of models are run until the researchers are happy with the model fit as provided in Tables A.1 to A.3. This meant dropping some or adding other factors into the modelling exercise). Secondly, using the propensity scores, a sample of treatment groups and their matched cases is generated. This normally consists of two groups, for instance, unmarried mothers and their matched cases in the married group. The current study extends this common technique to match multiple treatment groups: unmarried one-parent families, previously-married one-parent families and cohabitating families are matched to a control group of married two-parent families.

A variety of matching algorithms are considered in order to ensure that the matched cases include only those who are close enough to treatment families in terms of the propensity score. It is important to test the balance achieved by the matching exercise by assessing the reduction in absolute bias i.e. the standardised percentage mean difference in each covariate between the treatment and control groups (this represents, if you like, a goodness of fit test). If the propensity score estimation model is well specified, there should be little difference in pre-existing observed covariates between the treatment and control groups after matching.

This process, therefore, assesses the average difference in child outcomes across treatment and control groups. The selection bias problem highlights the need to estimate the effect of growing up in an unmarried one-parent family (technically known as the 'average treatment effect for the treated' or ATT) on those children rather than for all children (average treatment effect or ATE). The method has clear advantages over standard regression models when certain conditions are met. The method avoids serious mismatches by matching only similar cases, whereas standard regression models are likely to retain these cases, producing unrealistic average treatment effects. The propensity score matching method is semi-parametric with no assumption of functional forms for the relationship between the treatment variable and the outcome of interest. Standard regression models assume a specific functional form, which can make them prone to bias. Finally, the propensity score matching estimators are known to be more efficient and free from collinearity because only the estimated probability scores are required.

The propensity matching approach can, however, produce similar estimates to those from regression-based models if these standard models meet all the above prerequisite assumptions and have well-supported data. In addition, the propensity matching method assumes no selection bias on unobserved factors. It is, however, possible to incorporate a sensitivity analysis that examines how large

the unobserved selection bias problem would need to be to completely wipe out propensity score matching estimates of the effects of family structure on child outcomes. Details of the specific matching technique employed here and the sensitivity tests are reported in the next chapter.

Finally, it should be noted that a certain proportion of children still might not have their counterfactuals in the matched sample if their propensities scores are too high to find their matches in the married group. This 'common support' problem implies that, if so, one can only estimate the effects of unmarried motherhood on children from the subset of the treated group (Heckman et al. 1998). The issue of common support is again dealt with in the following chapter.

2.4 The Issue of Causality

Most researchers who study family structure and its effects on child outcomes use various forms of regression analysis. Though numerous studies have constructed comprehensive models that include many variables related to family structure, such as income and education, these models with statistical controls are not sufficient to establish causality. As Manski et al. noted:

> *It may be that, as the empirical evidence suggests, living in a non-intact family has adverse consequences for children. On the other hand, it may be that some unobserved process jointly determines family structure and children's outcomes. For example, parents who are less committed to their family may be more likely to divorce and may also provide less support for children* (Manski et al. 1992:25)

There is little doubt, according to international literature, that children who grow up in non-traditional families experience some disadvantages, but regression analysis alone cannot tell us why. Using more sophisticated statistical methods is critical for developing policies that effectively address the consequences of growing up in non-traditional families. Propensity score matching allows us to simulate 'treatment effects' by identifying similar children and determining statistically what the effect on a specific outcome might be if a child's parents had married or stayed married.

When examining the influence of family type on a set of outcomes, it is important to build comprehensive models that include an extensive set of family background and family process measures. Longitudinal data have allowed researchers elsewhere to include a series of mediating variables i.e. a set of prior or intervening factors associated with both family structure and child outcomes. In their meta-analysis, Amato and Keith (1991) showed that researchers who did not employ extensive background controls in their analysis overestimated the effects of divorce on child outcomes.

Drawing causal conclusions or making policy recommendations from these studies is, therefore, difficult. Insufficient samples, exclusion of prior control and mediating variables, as well as reliance on regression analysis, have prevented researchers from accurately determining the effects of family structure on child wellbeing. In order to assess causal effect, this report compares findings across a number of different models and includes a sensitivity analysis in order to address the issue of unobserved heterogeneity. Evaluating the 'true' causal effect of family structure, however, remains an elusive goal.

Instead, the aim of the current study is to understand better whether there is a causal effect running from family structure to child outcomes. Knowing that growing up in a one-parent family has causal effects is crucial for underpinning a wide range of public policies. For instance, children may alter their attitudes toward education while living in a one-parent family or, according to the selection perspective, the observed correlations between poor educational outcomes and one-parent families may reflect nothing more than correlated observables that affect both parents' family structure and children's later educational attainment. Testing this latter assertion represents the primary aim of this report.

Chapter 3 – The Selective Nature of Family Formation

The aim of this chapter is a general one i.e. to address the question of what are the observed characteristics of those who cohabit, marry, re-partner, or never marry, and have children? These characteristics will reflect the broader social context in which families' decisions are made. This allows us to address the first research objective, which is to identify differences in the socio-economic characteristics of family types and, thereby, highlight the fact that childbearing outside of marriage occurs non-randomly or is selective.

3.1 Preliminary Results

This section identifies the confounding factors or the observable characteristics which influence selection into family types and child outcomes. A confounding factor is, therefore, an observable variable that predicts both the treatment and outcome. These factors were chosen based theoretical considerations and previous research in the area.

A crucial condition for the applicability of matching is the availability of characteristics observed before the child outcome of interest was measured. Factors that were observed at the same time, or after the child outcomes were measured, could themselves be influenced by the outcome (hence the problem of reverse causality). Take, for example, the child's health: if the study included information on current household income, we could not be sure if poor health was caused by lower income levels or if lower income levels at home were related to poorer health levels in the family. If, however, information on income levels before the child was born was known, we could make some causal inference about the relationship between the child's health and family income.

Table 3 provides a list of the confounding factors employed in this analysis as well as showing the numbers and percentages of missing cases for each covariate. The first thing to note is the small amount of missing information across the wide range of factors presented in Table 3. The highest number of missing cases relates to more sensitive topics such as smoking during pregnancy or the amount of alcohol drunk. After assessing the nature of the missing cases, they were excluded from the logit analysis and imputation methods were not employed.[6] Issues of missing data, response bias, and an inconsistent responding index are available in Murray et al (2011).

Each of the factors in Table 3 were included in the first logit models as they were expected to influence the assignment of children to different family types and affect the child outcomes.[7] One example is the mother's age. If a woman has a child at a young age, then that child is more likely to be in an unmarried one-parent family. In other words, the mother's age, socio-economic status, and other factors, mean that children do not randomly end up in certain family types (Francesconi, Jenkins, and Siedler 2010; Lee 2010; Liu and Heiland 2012).

Therefore, much of the difference between children's development across family types will be due to this differential selection into families.

The confounding factors listed in Table 3 were taken from the reports of the parents (who are normally the primary caregivers): their own demographic characteristics (including nationality, religious affiliation and age), their socio-economic status (educational attainment), as well as priori measures such as the amount of alcohol they consumed while they were pregnant. A measure of the parents' socio-economic backgrounds was also included which measured the degree of difficulty their families had in making ends meet when the parents were 16 (ideally the child's grandparents social class would be used but this information was not collected in the GUI).

[6] Their exclusion did not result in any substantial bias.

[7] There are many other factors which could have been included in these models, such as the relationship status of the parent at the time of birth of the child but this information was not asked of all the mothers – see section 3.2.

As outlined in previous studies, information on the child was also employed, including their age (not all were 9 year olds) and measures of their general health at birth, as reported by the primary caregiver (birth weight, birth timing, time spent in a special care unit, whether they were breastfed etc.). The child's general health at birth is indicative of the parental background and captures larger social background differences at play (Jiang, Foster, and Gibson-Davis 2011; McCrory and Layte 2011). The same applies for factors such as parental height, as well as a variable which captures if the child has experienced a traumatic event, the imprisonment of a parent – which has been found to be a significant influence on child wellbeing (Pratschke, Haase, and K. McKeown 2011).

Table 3: *List of Confounding factors (including number/percentage of missing cases)*

Information relates to primary caregiver (PCG)	N	% missing cases
Age	0	0
Height	80	0.93
Religiosity/Spirituality	10	0.12
Religious Affiliation	9	0.11
Educational Level	0	0
Native Language	7	0.08
Citizenship	9	0.11
Country of Birth	7	0.08
Amount smoked during pregnancy	334	3.90
Amount of alcohol consumed during pregnancy	340	3.97
Chronic illness prior to childbirth	0	0
Degree of difficulty making ends meets at age 16	14	0.16
Parent has been imprisoned	0	0
Study Child (SC)		
Gender	0	0
Age	0	0
Birth Weight	118	1.38
Birth Timing	77	0.91
Birth Method	76	0.89
NICU / Special Care Unit	77	0.90
Breastfed	76	0.89
Birth order	0	0
Country of Birth	8	0.09

3.2 Differences across Families

Mother's Characteristics

The confounding factors can be classified into 3 categories: fixed and observable characteristics of the primary caregiver, priori measures relating to the parent, and fixed observable factors relating to the study child. Table 4 below presents variations in the first set of confounding factors across family types. It is clear that the characteristics of the primary caregiver, usually the mother, vary across families.

Marriage was more common among the older, more educated, and more religious mothers. The average age of a married mother in a two-parent family was 40 compared to 34 in a never-married one-parent family. Almost 19% of married mothers had a degree or higher-level educational qualification compared to 12% of unmarried mothers. Mothers in previously-married one-parent families had much in common with mothers in married two-parent families, given the selection into marriage. Separated, divorced or widowed lone-parents had an average age of 40 and 16% had a degree or higher-level qualification (see Table 4).

In terms of age differences, the never-married lone-mothers tend to be younger, with an average age of 34 years compared to an average age of 40 for married mothers. Never-married mothers tend to have children at a relatively young age, compared to all other women in the study. More than half of all unmarried mothers (58.5%) were less than 25 years old when they had their child compared to only 13% of married mothers. Previous studies have related this to poorer educational and employment prospects among this group of mothers (as outlined in Chapter 1). In the study, 1 in 10 never-married lone-mothers had some third-level qualification compared to 1 in 5 married mothers. Education is a particularly useful confounding factor as it is usually completed before family formation begins and remains unchanged born, in contrast with some other factors such as the mother's current occupation or current income, which are likely to have changed with the birth of a child and, hence, why they are not employed as confounding factors here.

In addition, marriage is more common among spiritual or religious women. When the primary caregiver was asked about their religious affiliation, 14.5% of never-married lone-mothers stated that they had no religious affiliation compared to 6.8% of married mothers (Table 4). The primary caregivers were also asked if they would describe themselves as spiritual or religious and almost 17% of never-married mothers stated they were "not at all" religious compared to 7% of married mothers. These results echo those of Fine-Davis (2011) who found that married couples were most likely to attend a religious service once a week.

In terms of religious affiliation, over 75% of those mothers who described themselves as Roman Catholics were married and living with their partner and almost 6% were cohabiting. Of those who described themselves as Christian, 67% were married and living with a partner and 4% were cohabiting, but the numbers in these groups are much smaller. In order to take into consideration any nationality differences in the relationship between family structure and child outcomes, three different confounding factors relating to nationality were included in the logit models. Of all the family groups, the never-married lone-mothers had the highest rates of Irish citizenship (96%), Irish birth (85%) and were the most likely to state that English was their native language (97%). This, yet again, highlights the homogenous nature of the never-married group.

Table 4: *Differences in the characteristics of the primary caregiver (usually the mother) across family types (full sample)* [8]

	Two parents		One parent	
PCG	**Married**	**Cohabiting**	**Previously-Married**	**Never-Married**
Male (%)	0.86	1.22	9.68[9]	6.50[10]
Mean age (years)[11]	40.23	34.95	40.47	34.26
Mean height (cm)	163.57	163.20	164.78	164.28
English native language	95.04	92.57	92.41	97.08
Irish citizen	93.70	90.04	87.39	95.57
Born in Ireland	84.68	83.10	78.40	85.38
Religion: (%)				
No religious affiliation	6.78	17.97	10.57	14.50
Christian (no denomination)	1.71	1.26	3.78	2.42
Roman Catholic	86.71	77.16	78.31	80.96
Anglican, Church Ireland or other Protestant	3.92	1.58	5.58	1.41
Other incl. Jewish, Muslim or Orthodox	0.69	1.68	1.77	0.65
Spirituality: (%)				
Not at all	6.88	15.37	10.52	16.84
A little	35.85	50.29	39.14	45.13
Quite	36.16	19.00	31.55	21.54
Very much	18.86	13.26	15.67	14.51
Extremely	2.24	2.07	3.11	1.98
Education: (%)				
None or primary	5.06	11.38	9.61	11.02
Secondary	59.9	68.39	57.89	62.03
Non-degree	16.34	10.82	16.45	15.24
Degree or higher education	18.70	9.42	16.05	11.71

Source: weighed data GUI child cohort, wave 1.

By contrast, the cohabiting families and previously-married one-parent families are less homogenous. As well as not having a clear composition in terms of pathways into these states, these groups differ significantly on key confounding variables. Little is known about the minority of cohabiting couples who have children. In general terms, the cohabiting families look more like the never-married one-parent families than any of the other family types in the study. In other words, they tend to be younger, indicating an earlier age at childbirth (with an average age of 35). They also tend to have lower levels of education and be less religious and spiritual (18% stated they had no religious affiliation). However, 1 in 10 mothers who cohabit are not of Irish citizenship compared to 6% of married mothers.

[8] Tables A.1 to A.3 show the full set of confounding factors used and their variation in the matched data.
[9] Most of these men are widowed.
[10] In the unweighted data, this figures stands at 3.78%.
[11] Current age was included in the models and not age at first birth since this could not be calculated in families where information was missing for children who had left the household.

The cohabiting group is made up of separated (n=49), divorced (n=30), widowed (n=4) mothers, persons of unknown marital status (n=77) and never-married cohabiting partners who represent the majority of the group (n=375). Focusing solely on the never-married cohabiting group, 66.6% of these mothers were younger than 25 when they gave birth and 90% were born in Ireland. Half of this never-married cohabiting group were already living with the father of the 9 year old when they had the child and 44% are now with a partner who is not the father of the child. The average number of children in never-married cohabiting families is 2.51 compared to an average of 1.97 for never-married one-parent families. In other words, even within this clearer defined smaller group of cohabiting parents, there exists a variety of backgrounds.

The information presented here is only a snapshot of these families at one point in time but some retrospective information was collected which allows us to draw some conclusions about the nature of cohabitation. Of the married majority, only 4% were cohabiting with the father of their child at childbirth, as most (84%) were married when they had their child. Cohabitation rates were higher at childbirth among those who are now separated or divorced with about 10% of those who are separated or divorced cohabiting at childbirth. Of the never-married lone-mothers, almost 25% were cohabiting with the father of the child at the time of birth. This again appears to point to the selective nature of marriage.

The others groups who cohabit come from differing backgrounds but, as the numbers are so small in the individual categories, it is hard to generalise about their characteristics. A number of issues, however, must be noted. Most of those (90%) who are living with a partner but of unknown marital status, were not living with anyone at the time of childbirth and almost 40% were not born in Ireland. In addition, for almost 30% of this group, English was not their native language, possibly pointing to a language barrier which affected their ability to answer the marital status question (in all the other family types, over 90% of the mothers stated that English was their native tongue).

The fourth and final category of parents is also a diverse group consisting of separated (n=494), widowed (n=90) and divorced (n=147) one-parent families. In general, this group is older than the never-married one-parent family group but this result is driven by the older average age of the widowed group. Educational levels are, on average, higher in this group compared to the other never-married lone-mothers, but this result is driven by the divorced group in the study. Given the small numbers, caution is advised in interpreting the results for the divorced and widowed groups but they appear to match national data. In the 2006 census, divorce was found to be more common among the better-off (Lunn et al. 2009). In the GUI data, 23% of divorced lone-mothers have a third level qualification, compared to only 10% of separated lone-mothers.

In addition, divorce appears to be more common among non-Irish nationals with 17% of divorced one-parent families coming from a non-Irish background, compared to a sample average of 7%. The divorce rate in Ireland is low by international standards (Fahey et al. 2008). Lunn and Fahey (2011) suggested that cohabiting unions and non-marital child-bearing have served to select less stable relationships out of marriage and concentrate union instability into these non-marital family situations. Marital separation is, however, much more common than divorce, so that that the overall levels of marital instability in Irish families as a whole are much closer to a European mean (Fahey 2012).

Ex-ante Factors

The second set of confounding factors employed in the matching exercise relates to the circumstances of the mother prior to the birth of the child. These factors capture some of the differences across families that existed prior to childbirth, which also influence the child's development. Given the fallibility of human memory, recall data of this kind is limited in its reliability and in how detailed it can be. Nevertheless, it provides us with an important quasi-longitudinal insight into what would otherwise be a static picture of the families of 9 year olds.

Table 5 below presents the ex-ante differences across family types. Previous research found that smoking during pregnancy is associated with lower educational levels among mothers and is related to a range of problems among children (Williams 2010). The mothers were asked how much they smoked or drank whilst pregnant (scaled items). The first thing to note in Table 5 is that smoking patterns among pregnant mothers show a stronger gradient than drinking patterns. Most mothers, regardless of family type, did not report to drinking any alcoholic beverages while pregnant, whereas smoking during pregnancy has a clear gradient: 13% of married mothers smoked while pregnant compared to twice that number of cohabiting or previously-married mothers and almost a third of all never-married lone-mothers admitted to smoking during pregnancy (Table 5).

Table 5: *Differences in the ex-ante characteristics of mothers across family types (full sample)*

	Two parents		One parent	
%	Married	Cohabiting	Previously-Married	Never-Married
Smoked during pregnancy	13.17	27.44	27.54	31.2
No alcohol consumed during pregnancy	62.57	61.66	64.85	67.76
Occasional alcohol consumption	35.96	36.18	33.65	30.72
Chronic illness prior to childbirth	5.57	7.07	6.26	10.54
Great difficulty making ends meets at age 16	9.14	16.78	12.75	11.84
Difficulty making ends meet	45.93	46.84	42.94	47.09
Easy to make ends meet	44.92	36.37	44.3	41.08
Child experienced parent's imprisonment	0.33	1.78	1.44	4.53

Source: weighed data GUI child cohort, wave 1.

Research has shown that long-term illness in a family leads to an increased risk of marital breakdown as the illness puts additional strain on relationships (M. Murphy, Glaser, and Grundy 1997). The mothers were asked if they had any long-term illness prior to the birth of their child. In general terms, chronic illness was more common in one-parent rather than two-parent families. Table 5 shows that 1 in 10 never-married mothers suffered from a chronic illness compared to 1 in 20 married mothers before the child was born. A more detailed breakdown reveals that mothers who are now separated from their husbands and rearing children alone reported the highest rate of illness prior to the birth of the child (at 21%). Rates of chronic illness were relatively high for all lone-mothers and also in the group with unknown marital status.

From a sociological perspective, the family has an important role to play in the reproduction of privilege and inequality. McLanahan and Percheski (2008), for example, show that in the U.S., family structure is an important mechanism for the reproduction of class, race, and gender inequalities. Ideally, studies should take into account the social background of the child's parents, for example, to control for any correlation between the parents' marital status/socio-economic background and their parents' status. The only measure indicating the socio-economic profile of the parental family homes relates to the degree of difficulty making ends meet that parents remembered having when they were aged 16. The highest rate of deprivation at age 16 was reported in the cohabiting group (17%), followed by the previously-married lone-mothers (almost 13% – but this result was driven by the older widowed group who had particularly high rates of family difficulties at age 16). The variable, therefore, captures some of the socio-economic background differences across families.

Previous research argues that child development is influenced by traumatic events such as a parent's death or imprisonment but these events are also more common in certain social groups. The final confounding factor entered into the logit models related to whether the child had experienced the imprisonment of a parent. Very few children in the study had experienced this (the sample average was 1%) but it is more common in never-married one-parent families (4.53% in Table 5).

There are a number of important factors missing here, most obviously information on how the relationship between the parents has changed over time. Married couples were not asked to state when they got married so it's not possible to say whether they began to live together as a married or cohabiting couple. In addition, in the case of those who started out as cohabiting couples, it is not possible to say when they made the transition to marriage. Relationship status at start of pregnancy is, therefore, missing from Table 5 since it was not available for the whole sample.

Study Child Characteristics

The final set of confounding factors relates to the child. Many of the confounding factors can be traced back to the year the child was born and, therefore, can suffer from recall bias (Table 6). The availability of the infant cohort will enhance the accuracy of these factors and future work of this nature. Below is a category of measures that describe the health of the child at birth. These measures, such as low birth weight, reflect the socio-economic background of the mother and will, therefore, influence child development.

Looking at the number of children of low birth weight (defined as less than 2.5 kg), clear differences emerge between family types, with 8% of children born to a never-married lone-mother being of low birth weight, compared to 5% born to a married mother (Table 6). This is related to the fact that never-married lone-mothers are more likely to have their child prematurely (2.9% compared to the sample average of 1.8%). Despite this relationship, minimum variation in family types was evident regarding the risk of a child being placed in a special care unit after birth (on average, 14% of children born to one-parent and two-parent families were placed in ICU).

The mode of delivery at birth has the potential to influence the long-term development of the child, for example, Huh (2012) found a link between the risk of obesity and caesarean section. In the current study, elective caesareans were more common among married mothers with almost 1 in 10 opting for a caesarean, compared to 3.5% of unmarried lone-mothers (Table 6). Emergency caesareans were more common: 10.3% of married and 8.6% of unmarried lone-mothers underwent emergency caesareans.

The child's birth order in the family has been found to influence their development. Black et al. (2010) for example, found that high birth order led to substantially lower educational attainment and, in turn, led to negative effects on adult employment, earnings and teenage childbearing. However, this effect could be related to family size and not birth order (Alison Booth and Kee 2005). In the data, the likelihood of being an only child is greatest among never-married one-parent families. Most of the children (68%) born into unmarried one-parent families were the first born as were most (64%) of the children born into never-married cohabiting families. This compares to 38% of first births among married couples and 34% of all births in the previously-married group (see Table 6). Information on the number of children in the family cannot be included as a confounding variable since it would capture information after the birth of the 9 year old. The intention of this research is to document the importance of selection effects, which capture the role of factors before the child outcomes of interest were measured and not afterwards.

In this regard, studies have shown that breastfeeding is important for a child's emotional, educational and physical development. McCrory and Layte (2011), for instance, noted strong socio-economic differences in rates of breastfeeding among mothers, which resulted in clear differences in children's educational scores. The lowest propensity to breastfeed was found among never-married cohabiting parents and never-married one-parent families (only one in three breastfed) compared to almost half

(47%) of married mothers and 44% of previously-married lone-mothers who breastfed their child (see Table 6). Information on the duration of breastfeeding suffered from substantial recall bias and, therefore, was not employed here (see McCrory and Layte 2011 for details).

Finally, the demographic characteristics of the child were included as confounding factors. Although the study was based on 9 year olds, not all children were that age. Therefore, it was important to take account of a child's age. The child's age ranged from 8 to 10 years, which will be strongly related to the child's development. In addition, 10% of the children in the study were not born in Ireland. The highest rate of non-Irish births (30%) occurred in the undefined marital status group, with the second highest rate in the divorced-parents group.

Table 6: *Differences in the characteristics of the study child across family types (full sample)*

	Two parents		One parent	
Study Child	**Married**	**Cohabiting**	**Previously-Married**	**Never-Married**
Male (%)	52.56	43.71	48.54	46.54
Mean age (months)	113.9	114.5	114	114.3
Birth weight (kg)	3.34	3.39	3.39	3.52
In NICU/Special Care Unit	14.04	15.07	13.25	15.87
Breastfed	47.17	30.22	43.63	32.30
Born in Ireland	89.55	89.81	84.92	90.11
First born	37.80	56.34	33.89	67.96
Birth Timing (%):				
Very early	1.62	1.45	2.60	2.87
Somewhat early	11.55	12.36	11.97	14.59
On time	62.57	58.13	59.89	53.22
Late	24.26	28.06	25.54	29.31
Mode of Delivery (%)				
Elective caesarean	9.80	4.4	8.31	3.55
Emergency caesarean	10.27	7.39	10.83	8.64
Assisted birth	11.93	14.59	6.36	12.46
Normal birth	67.72	73.84	74.49	75.24
Other	0.27	0.05	0	0.11

Source: weighed data GUI child cohort, wave 1.

3.3 Child Outcomes

All the above confounding factors are associated with family structure and affect child wellbeing. Wellbeing in this context is defined by reference to children's cognitive, social, emotional and physical health outcomes at age nine. This section describes the child outcomes employed in the study and summarises the evidence as regard the influence of confounding factors on these key areas of child wellbeing.

Educational Development

Three key measures of cognitive development are analysed in this research: maths scores, reading scores and school attendance rates (see Table 7 below). The Drumcondra academic performance tests (2007 revised edition) were administered to the children on a group self-completion basis under examination-type conditions in their schools. The maths test took two hours to complete and the reading test took 95 minutes. These are standardised tests of achievement in maths and reading vocabulary, designed for pupils in Irish primary schools. There were different levels of the tests administered, depending on which class the pupil was in (which is largely a function of the child's age).[12]

Beyond academic achievement, engagement with school is an important dimension of a child's educational experience. Teachers were asked to record the number of days each child had missed school "since the beginning of the current school year". The parents and school principals were also asked about school absenteeism but the teacher's report was taken as the measure used here (Smyth 2009). It is, however, worthy of noting the higher degree of missing information in relation to this question in Table 7. Further details on these measures are presented in the next chapter.

It is beyond the scope of this report to summarise the wide range of evidence regarding the influence of confounding factors on these outcomes so what follows summarises the key evidence regarding the factors which influence child outcomes from the *Growing up in Ireland* study to date. Focusing on the educational development of children, it is clear that the parents' educational levels influence the educational development of their children. Absenteeism is, for example, higher among families with lower levels of education. In addition, reading scores tend to be higher among the 9 year olds as mother's educational levels rise (see Smyth, 2009).

Beyond the mother's education, previous research has found that the following factors are important in understanding educational differences among children:

- Age of the mother at childbirth
- Child's nationality
- Child's gender
- Child's birth weight
- The languages spoken in the child's home
- The mother's experience of financial difficulty at age 16.

(Fahey et al. 2013; Selina McCoy et al. 2012a; Smyth et al. 2009).

In terms of nationality, Curry, Gillinan and Ward (2011) noted poorer school attendance rates and homework completion among the small number of migrant children in the GUI study.

Physical Health

Of all the child outcomes recorded in the GUI study, research on health differences has received the most attention. In this literature, a child's physical health is recognised as complex and difficult to measure and there is concern about the accuracy of self-reported indicators. This report focuses on a number of measures of child health: BMI (body mass index), diet, hospital visits and dental appointments (see Table 7). Height and weight are considered important indicators of childhood physical health and development. It is important to note that this information was directly measured by the interviewer in the course of the interview with the child. Children's height and weight measurements were then used to calculate BMI, which is widely used as a measure of body fat.

[12] The maths and reading scores were not adjusted to child's age/class level prior to analysis as age was included as a confounder in the initial logit models.

BMI is not the only important measure of physical health. There has been increasing interest in the quality and composition of children's diets. A number of factors influence children's dietary intake ncluding their own tastes and the income of the household. Children's dietary intake was also assessed in the study via parental recall of the study child's eating habits in the preceding 24-hour period using a 20-item semi-quantitative food frequency questionnaire. This report focuses selectively on just one aspect of children's dietary intake: their level of fresh fruit consumption, which has received less attention to date than the level of unhealthy snack foods (Layte, Harrington, et al. 2011; Layte, McCrory, et al. 2011).

In addition, two measures of the use of healthcare were analysed. The extent to which parents seek medical advice and treatment for their children varies across different social groups. In the course of the household interview, the primary caregiver was asked about the number of nights which the 9 year old had spent in hospital as an inpatient over his/her lifetime, excluding neonatal care. A total of 43% of the sample of children had experienced at least one night in hospital over their lifetime.

The second measure examined here was dental check-ups. In Ireland, dental care is available free at the point of use to all medical card holders, and for pre-school and school children attending state primary schools referred from child health service or school health service examinations. In the course of the interview, the primary caregiver was asked to indicate how often the study child visited the dentist. Overall, 62% of children visited the dentist at least once a year with lower income families less likely to do so (Williams 2009). More details on these measures are included in the next chapter but it is noted that some of these measure will suffer from recall error. However, by using a variety of outcomes, it is hoped to capture a more complete picture of a child's physical development.

Like educational outcomes, a child's physical and mental health is related to maternal education and the sex of the child (Greene et al. 2010). Merriman (2011) noted that pre-natal smoking is related to childhood obesity and McCrory and Layte (2011) found it to be associated with increased risk of behavioural problems in childhood. Greene (2010) noted that a child's height, weight, risk of chronic illness, mental and behavioural problems were all related to a child's gender. Girls, for instance, are more likely to be overweight, whereas boys tend to be taller and have more behavioural problems. Differences in a child's diet and BMI have been related to mother's age and educational levels (Layte, Harrington, et al. 2011).

Psychological Wellbeing

It is important to ask the children directly how they feel about their lives, in order to measure their subjective wellbeing. The children in the study were asked to complete a detailed set of 35 questions known as the Piers-Harris II Self-Concept Scale (Piers 1984). It gathered information about how children perceive themselves across the six domains of:

1. Behavioural adjustment (e.g. "I am well behaved in school" and "I do many bad things")
2. Intellectual and school status (e.g. "I am smart" and "In school I am a dreamer")
3. Physical appearance and attributes (e.g. "I have nice hair" and "My classmates in school think that I have good ideas")
4. Freedom from anxiety (e.g. "I get worried when we have tests in school" and "I am often afraid")
5. Popularity (e.g. "My classmates make fun of me" and "I am popular with boys/girls")
6. Happiness and satisfaction (e.g. "I am a happy person" and "I am cheerful").

Children absorb information about themselves and their relationships with others and they form beliefs about their personal features such as physical attributes, abilities, personality, values, goals and roles. These beliefs accumulate to create a self-concept. A positive self-concept is, in most cases, associated with desirable traits such as responsibility, independence and emotional security, whereas a negative self-concept shows links with fear, apathy, anxiety, and insecurity. Self-concept has longer term implications with a positive self-concept linked with life satisfaction (Parker, Martin, and Marsh 2008), job performance (Bono and Judge 2003) and recovery from illness (Markowitz 2001).

The Piers-Harris instrument defines self-concept as a relatively stable set of attitudes, reflecting both the description and evaluation of one's own behaviour and attitudes. This was administered to the children in a group self-completion setting within the school, after the Drumcondra reading and maths tests. On the scales, higher scores indicate a higher degree of self-esteem and self-regard, whereas lower scores indicate a more negative self-concept. From totalling scores in each of the 6 subscales, an overall self-concept score can be calculated. This can range from 0 to 80. The average score for 9 year olds in the GUI study was 49, which is very much within the average classification of 45-55 (Williams 2009).

The Piers-Harris scale and subscales were chosen as key indicators of a child's mental and emotional wellbeing for the purposes of the current study (see Table 7). An 'Inconsistent Responding' and a 'Response Bias' index were included to identify random response patterns and tendencies to respond in a certain manner irrespective of item content, such as a positive response bias (see Murray 2011) but it is important to note a varying degree of missing information across the scores in Table 7. Given the nature of the scales, it was not possible to impute missing data. In contrast to all the other outcome measures, these questions were answered by the children themselves. The child's gender and family situation influences the attitudes and beliefs that a child holds about themselves (McAuley and Layte 2012). Russell found that children display higher levels of emotional and behavioural problems if their mother has suffered from depression (Russell and Thornton 2010).

Pratsche et al. (2011) have shown that the overall wellbeing of children in two-parent families cannot be understood without simultaneously analysing the wellbeing of their parents. They found that a child's overall wellbeing was significantly influenced by their gender, whether they had suffered a life event such as the death or imprisonment of a parent, by their ethnicity, as well as their mother's education, health and age.

Table 7: *Child outcome measures and missing data*

Educational Development	N	% Missing Cases
Drumcondra maths score	119	1.39
Drumcondra reading score	212	2.47
School attendance	673	7.85
Physical Health		
Body Mass Index	432	5.04
Fruit in the diet	3	0.04
Hospital visits	8	0.09
Dental appointments	11	0.13
Psychological Wellbeing		
Piers-Harris Total Score	586	6.84
Behaviour adjustment	419	4.89
Intellect and school status	476	5.56
Physical appearance/attributes	481	5.61
Freedom from anxiety	381	4.49
Popularity	298	3.48
Happiness and Satisfaction	371	4.33

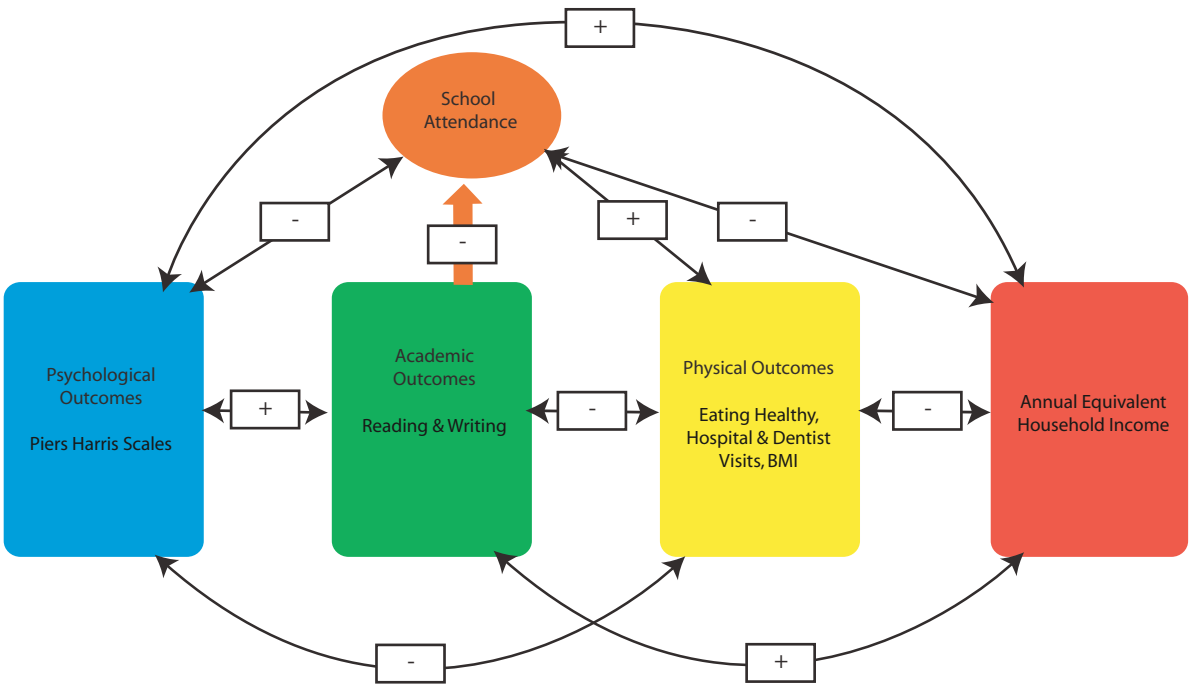
Source: GUI child cohort, wave 1.

Of course, the numerous indicators of child outcomes just outlined correlate with each other, although mostly weakly, and thus relate to different aspects of child wellbeing.[13] Figure 1 summarises the raw relationship between the range of child outcomes i.e. it doesn't control for any confounding factors (the full correlation table is available in the appendix). There is a weak positive relationship between having high grades and having high scores across the Piers-Harris scales (e.g. with a correlation coefficient of 0.21 and 0.23 with maths and reading scores, respectively, and the total Piers-Harris scale). In addition, the more school days a child misses, the lower their Piers-Harris self-concept scores (correlation of -0.07), the lower their scores in maths and reading (correlation of -0.10 and -0.07), the higher their BMI (0.07), and the more likely they are to visit the dentist (0.03) and hospital regularly (0.08). However, these relationships are very weak, reflecting almost no association, although statistically significant.

Again, there is a weak correlation between the Piers-Harris scale and physical outcomes, i.e. those who have high positive outcomes in the Piers-Harris scales have a lower number of visits to the dentist (-0.07), have a lower BMI (-0.06) and eat more fruit (0.06). A negative relationship was evident between the academic outcomes and physical health outcomes. Those children who score high in maths and reading were less likely to be overweight (-0.08 and -0.07 respectively), visit the dentist less often (-0.06 and -0.05) and have less hospital visits (-0.06 and -0.05).

To conclude, the association of child outcomes with each other is far from complete. Figure 1 (and Table A.4) also shows the association between child outcomes and equivalised household income, measured at the time of interview, which is also weak. In other words, higher levels of household income are associated with better academic results (correlation of 0.19 with reading scores and 0.15 with maths scores), less school absenteeism (-0.07), and more positive self-concept among the children (0.07), but only weakly. In addition, there is a weak correlation between income and measures of physical health. As outlined in this section, income is not included in the PSM analysis since it was measured at the time of interview (see Chapter 5 for further discussion).

Figure 1: *Summary of the relationship between the child outcome measures*



[13] With the exception of hospital visits which have few significant correlations. The number of hospital visits was not significantly correlated with any of the physical health or psychological wellbeing outcomes.

Chapter 4 – Propensity Score Matching Results

4.1 The Matching Exercise

The first part of the analysis was to compute the propensity score for each child. Logit estimates which predict family status, by all the confounding factors, confirm the overall picture depicted in the previous chapter (see Tables A.1, A.2 and A.3). Compared to children in the traditional married two-parent family, children in cohabiting and never married one-parent families tend to come from socio-economically disadvantaged backgrounds (the full data estimates can be found in Table A.1 which includes the log likelihood of the final model and the model's overall statistical significance). These children were statistically different from their counterparts at the 0.05 levels in terms of most of the pre-existing observed confounding factors (Tables A.1 and A.2). Previously-married one-parent families, however, tend to be more similar to the control group (Table A.3).

Children were matched on the propensity score obtained from the logit models so that they resemble each other on these multiple confounding factors, but for the fact that they were growing up in different family structures. Relatively small numbers were missing on these confounding factors so the propensity score was estimated with almost the full sample – excluding those cases where the father was the primary caregiver (see Tables A.1 to A.3 which include the full model estimates and appropriate measures of model fit).

Three issues arise in implementing propensity score matching which affect the matching process:

- Whether or not to match with replacement
- How many comparison units to match to each treated unit
- Which matching method to choose.

Matching with replacement was employed as it minimises the propensity score distance between the matched comparison units and the treatment unit. In other words, each treatment unit was matched to the nearest comparison unit, even if a comparison unit is matched more than once. This is beneficial in terms of bias reduction.

The comparison units were chosen based on the nearest-neighbour method, which selects the *m* comparison units whose propensity scores are closest to the treated unit in question. Nearest neighbour matching faces the risk of bad matches if the closest neighbour is far away. This was avoided by imposing a tolerance level on the maximum propensity score distance (calliper). The use of the calliper means that fewer units were used when good matches were not available, the idea being to ensure that treatment units were not matched to comparison units (married two-parent families) that are very different.

Any unmatched comparison units were discarded (generally small numbers) and were not used in estimating the effects of family structures on child outcomes. In this case, one can estimate the causal effects of family structure for the subset of the treated group for which there is support (Heckman et al. 1998). The performance of different matching estimators was assessed prior to the settling on nearest neighbour (50), calliper (0.01) (see the appendix for different model estimates). The calliper restricted matches to have a difference in the propensity scores within one percentage point.

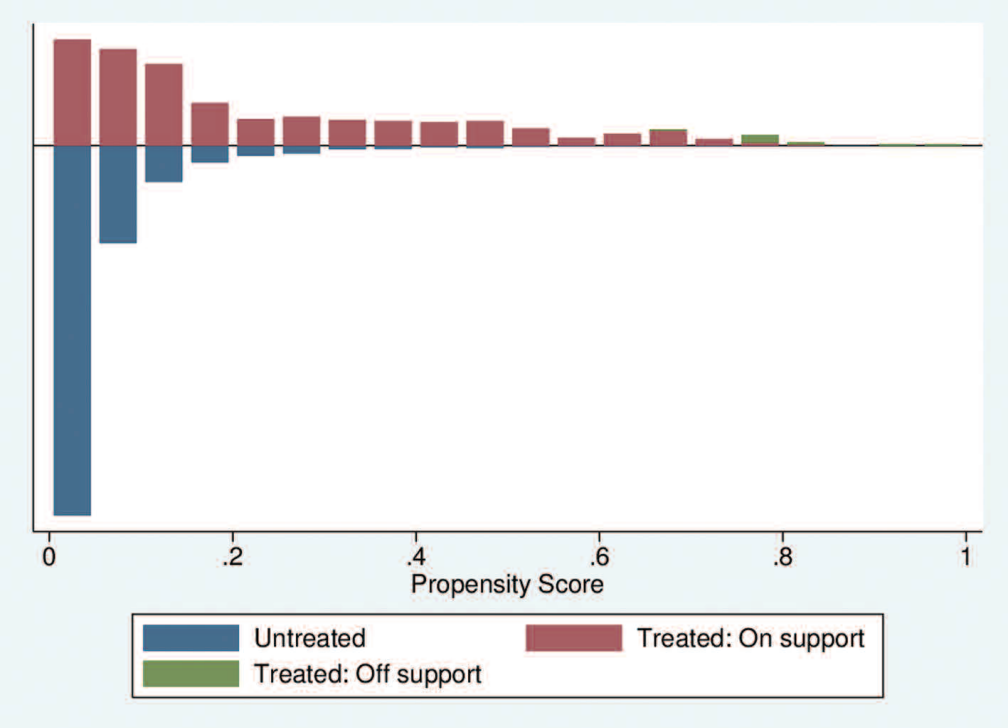
The treatment effects or average difference in means was then compared across a range of models and tests were carried out for unmeasured bias. Before presenting those results, the first important concern, however, is to ensure that the matching exercise produced family groups as alike as possible. The fundamental assumption for the validity of matching is that, when observable characteristics are balanced between the family types, the groups are balanced with respect to all the characteristics relevant to the child outcomes. This assumption, however, relies on having a large number of available pre-intervention characteristics.

The existence of a substantial overlap between the characteristics of the treated and control groups (common support) is a requirement for the applicability of this method. The easiest way to assess this is a visual analysis of the density distribution of the propensity score in the different family/ treatment groups (see Figures 2, 3 and 4 below). The density distribution of the propensity scores supports the common support or overlap region for treated and non-treated groups. The bottom half of each graph shows the propensity score distribution for the non-treated i.e. married two-parent families. The upper half refers to the treated individuals (3 treatment groups).

There was much discrepancy between family groups. Figure 2 compares children in cohabiting families to their married counterparts in the matched sample by the predicted probabilities of cohabiting obtained from the logit model in Table A.1. Serious mismatches exist in the region where a predicted probability of cohabitation is higher. To satisfy the requirement of common support, observations outside the maximum propensity score for this group were dropped (treated: off support N=14 or 3% of treated cases were dropped).

Figure 4 compares children with never-married lone-parents to those with married parents in the matched sample by the predicted probabilities of lone-motherhood obtained from the logit model in Table A.3. A similar mismatch is evident in Figure 4, enforcing the loss of 14 treated cases (3.3%). Figure 3 runs the same analysis for previously-married lone-mothers and a different picture is evident, as the predicted probabilities are similar (only 3 treated cases were off-support). Children in previously-married one-parent families and their matched counterparts largely overlapped with each other. The groups are well matched, indicating that there is little difference in the confounding factors.[14]

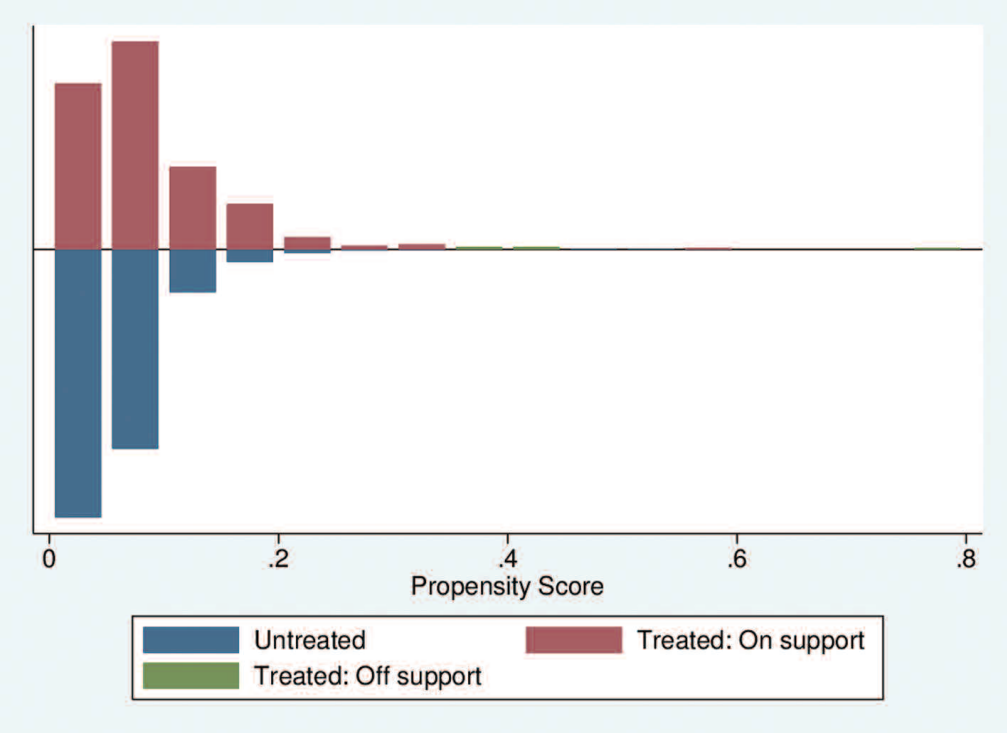
Figure 2: *Predicted probability of cohabitation (treated) (matched sample)*



Note: Off support N=14

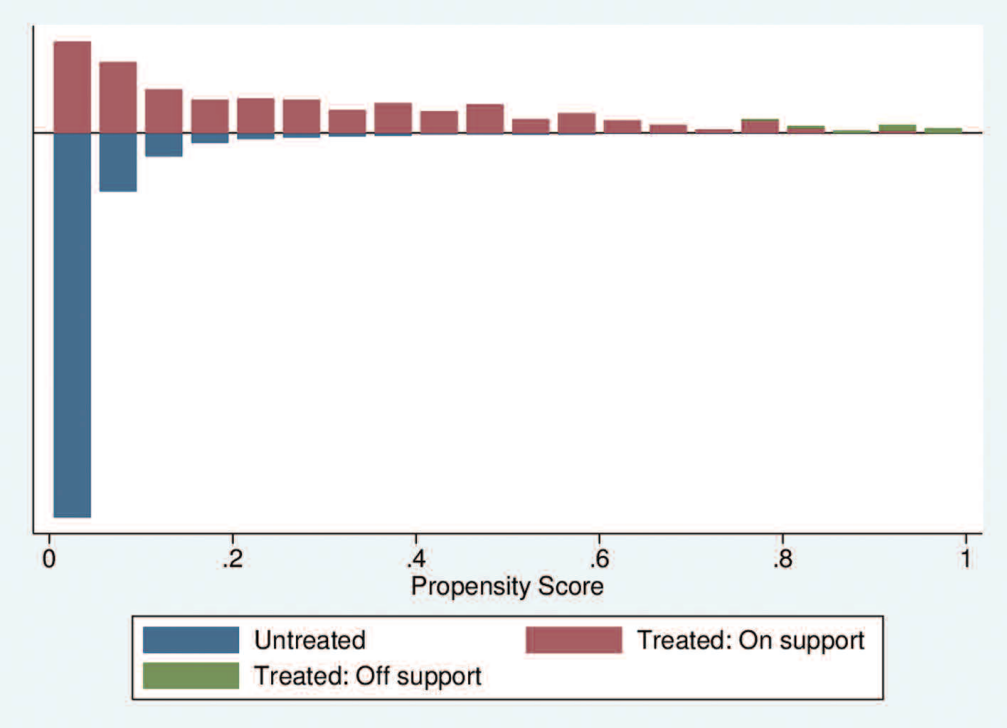
[14] Maths outcome-specific matched samples are shown in Figures 2 to 4 but other outcome-specific matched samples produce almost the same patterns of overlapping (not shown here).

Figure 3: *Predicted probability of previously-married lone-motherhood (treated) (matched sample)*



Note: Off support N=3

Figure 4: *Predicted probability of unmarried lone-motherhood (treated) (matched sample)*



Note: Off support N=14

The second test is to assess that the matching procedure was able to balance the distribution of the relevant variables in the control and treatment groups. The situation before and after matching was checked to see if there were any differences remaining after conditioning on the propensity score (Tables A.1 to A.3). The ideal is that there are no significant differences across treatments groups compared to the control group. The tables generally show that this was the case (the final columns in Tables A.1 to A.3 list the percentage of bias reduction between the treated groups and the control group). The use of multiple treatment groups does, however, have a drawback in terms of the range of confounding factors. This can be seen by comparing the first table (Table A.1) to the other tables (Tables A.2 and A.3) where matching the cohabiting group to the control group was not ideal.

In the unmatched data, it is clear that there was a range of significant differences in the characteristics of cohabiting versus married two-parent families (Table A.1). The cohabiting mothers were younger, less religious, less educated, significantly less likely to have breastfed their child but more likely to have smoked during pregnancy. Children within cohabiting couples were more likely to be female, of lower birth weight, significantly less likely to be born by elective caesarean and more likely to be born into a smaller family. After matching, no significant differences remain between these two groups in terms of age, religious affiliation, educational levels and parental background such as smoking, teenage deprivation and tendencies to breastfeed (Table A.1). In the matched data, for example, there was a 98% reduction in bias due to age differences between these two groups. On average, both groups are aged 35 in the matched data.

Despite testing different matching procedures, there were some issues with this cohabiting group that could not be resolved. In the matched data, there is still a significant difference between married and cohabiting parents in terms of spirituality, although the bias is greatly reduced in the matched data (67% in Table A.1). More problematic are some differences that became apparent in the matched data that were not significant in the unmatched data. In this regard, some bias was introduced into the matched data in terms of four variables: citizenship, language spoken at home, birth timing and birth mode show an increase in absolute bias in Table A.1. This is probably a function of the multiple treatment models as the matching exercise works significantly better for the other treatment groups.

Turning to the separated, divorced or widowed one-parent group, it is immediately clear that the matching exercise has reduced bias in all cases and no significant differences in terms of the range of confounding factors between married parents and the previously married one-parent families are evident (see Table A.2). As discussed previously, these two groups are more similar to each other than the other treatment groups are similar to the married sample. In terms of the unmatched data, however, there was a range of differences apparent between the groups, for example, the mother in these one-parent families was significantly more likely to be Catholic, more likely to have lower secondary educational levels, and more likely not to be of Irish heritage (see the unmatched data in Table A.2).

Finally, in all but one case, the matching procedure was able to balance the distribution of the pre-existing observed covariates in the married control group and the never-married one-parent treatment group (Table A.3). In the unmatched data, the unmarried mothers were significantly younger than the married caregivers. They were also less likely to be Catholic or to declare they were spiritual and more likely to have lower levels of educational achievement. The children born to unmarried mothers were more likely to be born somewhat early and be of a lower birth weight, less likely to be breastfed and more likely to have a mother who had suffered from a chronic illness prior to the birth and smoked during pregnancy. Elective caesarean births were again more common among the married group as were higher levels of reported teenage deprivation. Strikingly, these two groups are well matched, indicating that there is little difference in the confounding factors (see Table A.3). The matched sample shows a significant percentage reduction in absolute bias in all cases (although one variable, native language, is still significant after matching in Table A.3). Overall, balancing on confounding factors was generally achieved by matching.

4.2 Results

The series of graphs below illustrate the propensity score matching results of the effects of family type on child development. The matching estimates are the simple values for each child outcome in the matched sample. The raw and weighted raw estimates are also plotted to demonstrate the power of the matching exercise. In addition, an estimate which takes account of school-level clustering is provided in the graphs. All the outcome-specific matched samples have strong common support, ranging from 96 to 99.99%. This indicates that the propensity score matching method succeeds in locating almost all children who are not currently living with married parents but share similar pre-existing observed characteristics with children in married families.

Educational Development

The graphs below plot the percentage of correct answers on the Drumcondra maths and reading tests for each of the treatment groups compared to the married control group (Figures 5 to 7). The vertical line at 0 marks the point of no difference in scores between treatment and control groups. On average, children scored 54% in maths and 67% in the reading tests. Even at this early age, children were, therefore, not doing as well in maths as reading.

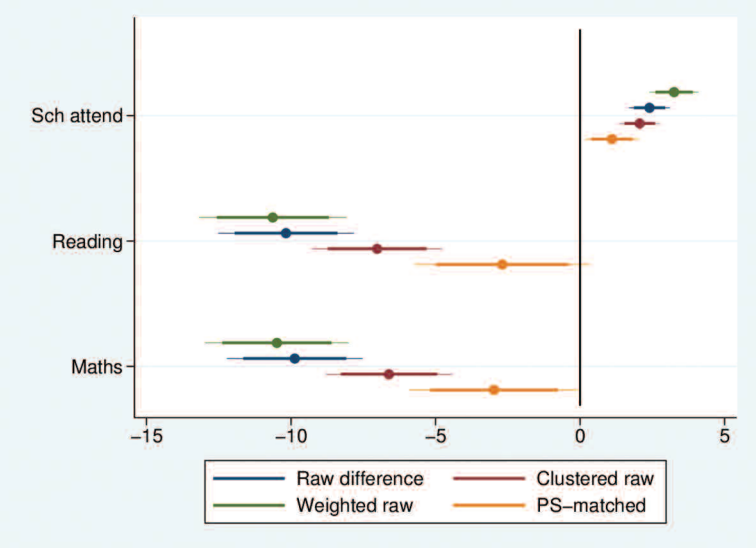
As outlined in the previous chapter, engagement with school is another important dimension of a child's cognitive wellbeing. Teachers were asked to record the number of days each child had missed school "since the beginning of the current school year". Teachers recorded an average absence of 6.4 days across the group of 9 year olds. Differences in this rate across the treatment groups are also plotted below ('Sch attend' in Figures 5 to 7). Absenteeism is likely to have long-term consequences for the child as it has been found that increased rates of absenteeism affect academic success (Kearney 2003; Truby 2001) and is associated with early school leaving (S. McCoy 2007).

The graphs below plot the average difference i.e. point estimates in these three measures in the treatment groups compared to the married control group, with the lines reflecting 95 and 99% confidence intervals. There are two important aspects in the graphs: firstly, the size of the effect difference between treatment and control groups and, secondly, whether the effect is statistically significant or not (this latter issue is problematic and will be discussed later in this section). In Figure 5, the green lines reflect the weighted raw difference in the child's educational outcomes between cohabiting and married families. In terms of reading scores, for instance, children from cohabiting families scored on average 10.63% less than children with married parents ('Reading' in Figure 5). This rather large raw difference does not take account of any socio-economic differences between family types.

The orange line in Figure 5 shows the difference after propensity score matching and, thereby, takes account of any measured selection bias between these family groups. Once selection effects are taken into consideration, children from cohabiting families score 2.69% less on the reading test compared to their married counterparts. In other words, selection effects have accounted for 75% of the difference in reading scores.

A similar pattern is evident for maths scores ('Maths' in Figure 5). Initially, large differences are evident in children's math scores: children in cohabiting families score on average 10.59% less when compared to children in married families (weighted data). Once the factors that select parents into cohabitation which also influence child outcomes are taken into consideration, the difference in scores is reduced to 3% (matched data). In other words, selection bias accounts for over 70% of the difference in initial math scores.

Figure 5: *Estimated educational differences between children living with cohabiting parents and those living with married parents*



Note: Confidence intervals are calculated from robust standard errors for the matched sample.

Teachers reported that children from cohabiting families were, on average, missing three more days from school than the average for children from married families (the weighted average is reported in Figure 5). After matching, this difference was reduced to one day (see 'Sch Attend' in Figure 5). Yet again, much of the difference is related to selection effects but, after matching, statistically significant negative estimates remain in terms of the effects of cohabitation on children's educational development (at the 95% confident interval in Figure 5).

Statistically speaking, therefore, important differences appear to remain despite taking account of observed selection bias but the size of the differential is greatly reduced. The reported confidence intervals, however, do not take into account the fact that the propensity score is estimated. This problem has motivated the use of bootstrap standard errors but this is also problematic (Abadie and Imbens 2006). It is important not to place too much weight on the statistical significance of these results as displayed in the graphs presented in this chapter (for further discussion see the next chapter).

Ignoring for now the issue of statistical significance, what is clear is that the educational outcomes are indeed subject to serious selection bias and, once this is taken into consideration, the sizes of the average treatment effects are greatly reduced (Figure 5). Any remaining differences can be understood in relation to a number of factors. Firstly, the matching exercise was not exact for the cohabiting group so we are not comparing like-married with like-cohabiting on some of the confounding variables (see Table A.1). Secondly, the cohabiting group is not homogenous as it includes never-married cohabiting partners, some of whom are the biological father of the child and others who are not, as well as previously-married mothers who are now cohabiting with a new partner. Manning (2002) argued that key comparisons should be made between cohabiting biological parents and married biological parents, and cohabiting partners and step-parent families. When Manning made these distinctions, she found no significant differences in behavioural outcomes and school achievement for children living with cohabiting compared with married biological parents.[15]

[15] Such a classification could not be employed here as outlined in section 2.1.

In the Irish case, much of the remaining cohabitation effect, as seen in Figure 5, may be related to a step-family effect. Thornton and Nixon (2011) employed a wider range of factors i.e. not just confounding factors, in their analysis of behavioural differences, but despite taking account of income effects and parental occupation, children in step-parent families displayed higher levels of emotional and behavioural problems. Brooks (2012), who employed individual, family, neighbourhood and school factors in her analysis of child outcomes, also found that children in step-families were scoring less well in math but not in reading tests, despite taking account of a wide range of factors. Bumpass and Lu (2000) related this step-parent effect to children adjusting to a new partner in the household.

Raley and Wildsmith (2004) found that cohabitation is more unstable than marriage, and thus exposes children to more family transitions such as moving house or school, which represents a threat to their development and wellbeing (Irish evidence on this front is available in Fahey et al. 2013). In addition, it could also be that marriage is a signal of greater commitment, resulting in greater investments in children. The key point remains that much of the raw difference in educational outcomes has been explained by selection effects as seen in Figure 5.

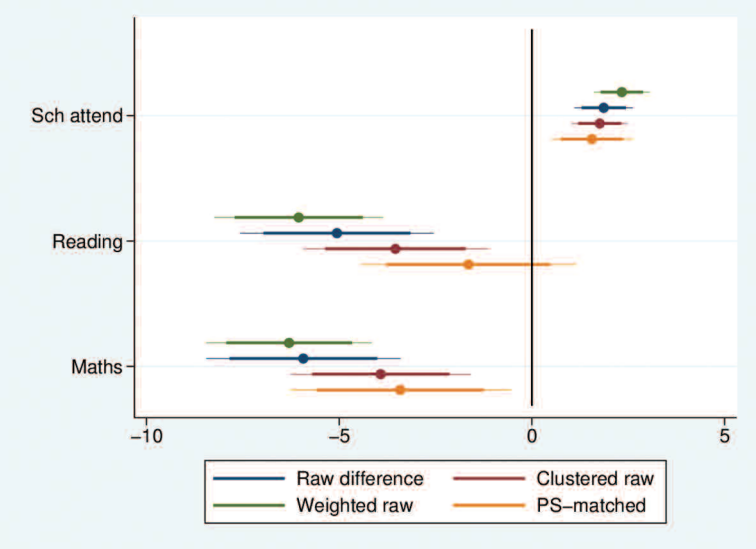
It is impossible to discuss a child's development – be it social, educational or psychological wellbeing – without taking account of school effects. Children are clustered within schools/neighbourhoods and the characteristics of those schools impact on their development. The red line in Figure 5 takes account of the clustering of children within schools in the matched data. It can be seen that in all cases, schools make a substantial difference. In other words, children within the same school perform similarly on the tests administered in the study and have similar rates of absenteeism. Taking account of the school effect alone accounts for 37% of the difference in maths scores, 34% of the difference in reading scores and 36% of the difference in school attendance rates between cohabiting children and their married counterparts (Figure 5). In other words, on top of the important role of selection bias, schools matter and much of the differences in children's educational development can be explained by this school effect.

Turning now to differences in educational outcomes between children in one-parent compared to two-parent families, a similar pattern is evident (Figures 6 and 7). Selection bias accounts for a substantial amount of the initial difference in maths and reading scores and absenteeism rates. The raw differences in rates of educational performance are more similar, however, when children living in separated, divorced or widowed one-parent families are compared with their married counterparts (Figure 6). Without taking account of any other differences between these family types, children in these previously-married one-parent families scored, on average, 6% less on the maths and reading tests and missed school two days more than their married counterparts. Strong selection effects were in operation so, once this bias is taken into account, the size of the differential is reduced to 3.4% for maths, 1.6% for reading and 1.5 days absent.

Figure 6 also shows that school clustering is important. Much of the initial raw differences in test scores evident across these family groups can be explained by simply taking the clustering of children within schools into account.

Comparing the red and yellow lines in Figure 6 reveals the significant explanatory power of school effects. Turning now to reading test scores, selection bias on observed pre-existing characteristics accounts for three-quarters of the difference in reading scores between children in previously-married one-parent families compared to their married counterparts. School clustering alone accounts for about 40% of the initial raw difference (Figure 6). In all cases, the propensity score matching and school effects estimates are much smaller than the initial weighted raw difference across families.

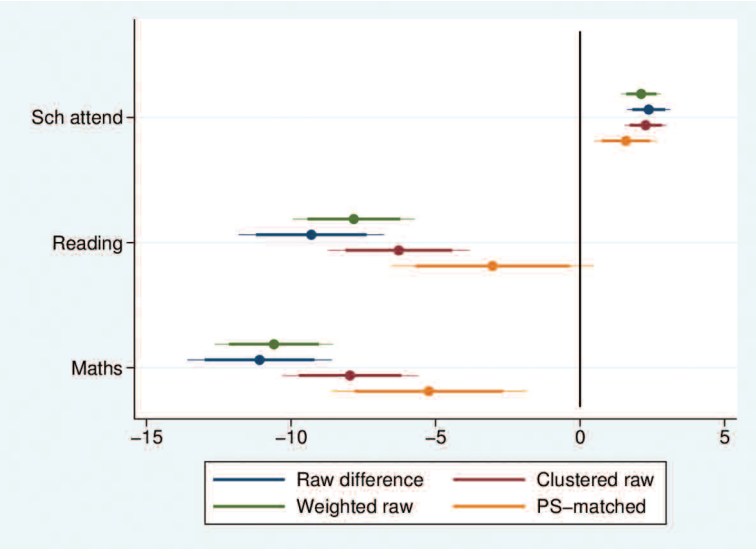
Figure 6: *Estimated educational differences between children living with previously-married lone-parents and those living with married parents*



Note: Confidence intervals calculated from robust standard errors for the matched sample.

Maths performance for children in never-married one-parent families appears to be particularly problematic (see Figure 7). Children from these families scored 10.6% less on the maths test, 7.8% less on the reading test, and missed school on average two days more than their married counterparts. Despite taking account of selection bias, substantial differences remain in educational outcomes, especially in relation to maths scores (Figure 7). Children living in never-married one-parent families were still scoring 5.2% less in the maths test, 3.03% less in the reading test and were missing 1.5 days more at school after matching. In regards to maths performance, selection effects reduced the size of the differential by half but substantial differences remained, despite taking the clustering of children within schools and selection effects into account.

Figure 7: *Estimated educational differences between children living with never-married lone-parents and those living with married parents*



Note: Confidence intervals calculated from robust standard errors for the matched sample.

To summarise, selection effects are important and they affect the range of educational outcomes. The rationale for matching is to address the counterfactual question of what would these educational outcomes have looked like if we could somehow alleviate differences in the propensity to be a cohabiting or solo-parent. Even if we could, we still see differences in the educational outcomes of children but, importantly, these differences are much smaller.

Physical Health

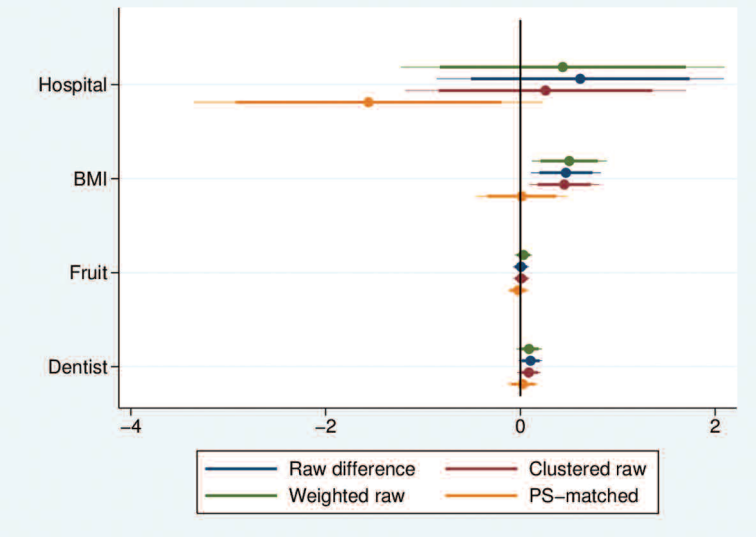
One of the main findings to date from the GUI study is the prevalence of childhood obesity and overweight issues (McCrory and Layte 2011). Just over 25% of the 9 year olds were found to have a BMI outside the 'healthy' range. Being overweight as a child has been associated with significantly lower self-esteem around physical appearance and popularity and worse emotional and behavioural problems (McCrory and Layte 2011). Here, the issue to be addressed was how a child's physical health varies across families. With respect to health differences, Figure 8 plots differences between children living with cohabiting parents and their married counterparts.

In terms of BMI, children with cohabiting parents were scoring slightly higher on this index but, post-matching, there was no difference in BMI between children in cohabiting families compared to their married counterparts. In terms of the amount of fruit in the child's diet, there was no initial difference in the amount of fruit consumed by these children.

Children living with cohabiting parents appeared slightly more likely to spend time in hospital when compared to children in married families. Once the differing backgrounds of these families was taken into account, however, children with cohabiting parents were, on average, spending less time in hospital (on average 1.6 days less) as reported by their mother compared to their married counterparts (Figure 8). In other words, the increased likelihood of hospital stays for cohabiting children was related to their deprived socio-economic backgrounds and not to cohabitation per se.

Finally, there was no evidence of difference in rates of dental visits between children living in cohabiting families compared to married families.

Figure 8: *Estimated physical health differences between children living with cohabiting parents and those living with married parents*



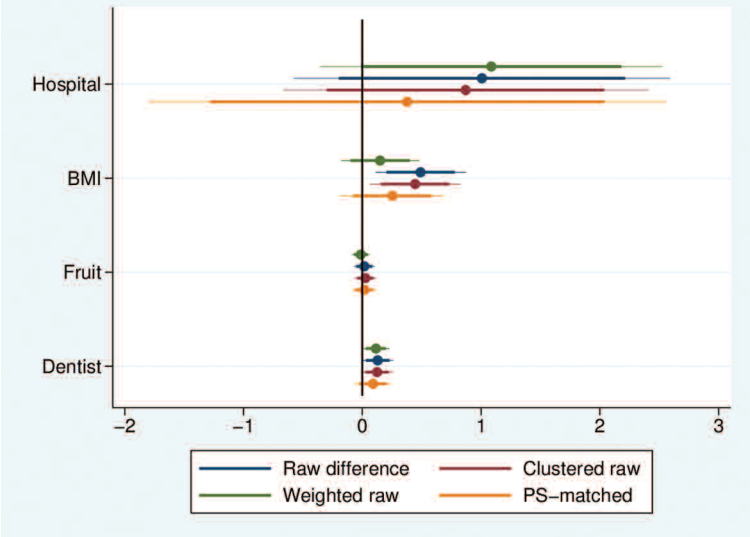
Note: Confidence intervals calculated from robust standard errors for the matched sample.

The clustering of children within schools is important when it comes to differences in rates of hospital visits and, to a far lesser extent, BMI (the red lines in Figure 8). We will return to this point in the next chapter but for now it is important to note that school clustering is probably picking up important neighbourhood effects, whereby children from non-traditional families are more likely to attend certain schools and live in certain areas.

In terms of one-parent families, there were small BMI differences apparent between children living in previously-married one-parent families compared to their married counterparts (Figure 9). There was little difference in terms of the amount of fruit consumed and the number of dental visits between these children in the weighted data. Children with previously-married parents were slightly more likely to visit the hospital but, once differences in selection into these states were taken into account, the size of the differential was again greatly reduced (Figure 9).

School effects explained some of the differences in rates of hospital visits among these children (comparing the red and green lines in Figure 9). Overall, however, few significant physical health differences were apparent between children living in previously-married one-parent families and their married counterparts.

Figure 9: *Estimated physical health differences between children living with previously married lone-parents and those living with married parents*

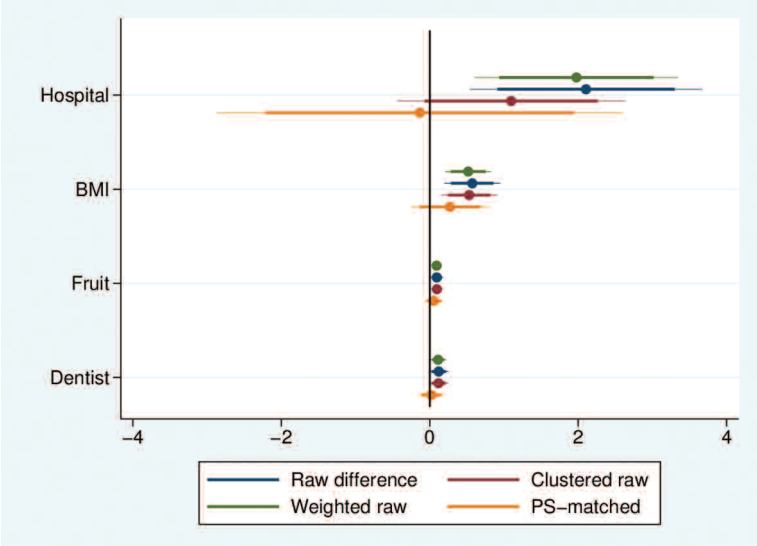


Note: Confidence intervals calculated from robust standard errors for the matched sample.

The greatest raw differences in BMI and hospital visits were seen when children living with never-married lone-parents were compared to those living with married parents (Figure 10). The differences were almost entirely related to selection factors. Once selection bias was taken into account, there were no significant differences in rates of hospital visits or BMI between them (Figure 10). Children with never-married lone-parents were slightly more likely to visit the dentist but, post-matching, no significant difference in dental rates was evident. The same pattern was found with fruit intake.

To summarise these health effects, the largest raw difference in terms of a child's physical health across family types was found in relation to the number of hospital visits. Smaller differences were found in terms of BMI, fruit intake and dental visits. Post-matching, all but one difference appears to be significant in terms of effect size (children from cohabiting families were less likely to visit the hospital when compared to their married counterparts in Figure 8). School clustering was found to matter, to varying degrees, particularly in relation to the number of hospital visits. Compared to educational outcomes, fewer differences were evidence in the physical health of children across family types both pre and post matching (the point estimates appear closer to the line of no difference in Figures 8-10).

Figure 10: *Estimated physical health differences between children living with never-married lone-parents and those living with married parents*

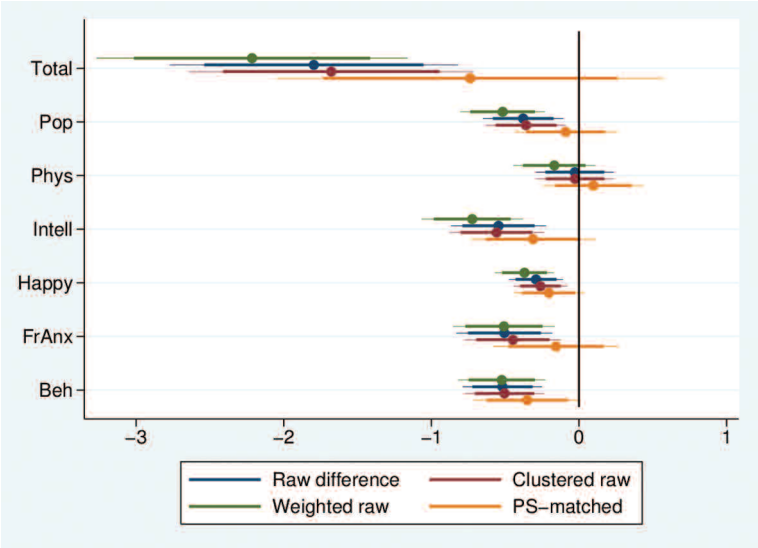


Note: Confidence intervals calculated from robust standard errors for the matched sample.

Psychological Wellbeing

The third and final measure of child wellbeing analysed here is the well-established 'Piers-Harris Self-Concept Scale' (as outlined in section 3.2). The graphs below show the averages in each of the 6 subscales and the total overall score for each of the treatment groups compared to the married control group (Figures 11 to 13). In terms of raw weighted differences, it is clear that children from all the treatment groups score lower on the total overall score (the green lines in Figures 11 to 13) indicating more negative self-concept when compared to children with married parents. These differences are greatly reduced once selection bias is taken into consideration (the yellow lines in Figures 11 to 13). In other words, children from these families scored lower on the total score mostly because of the differential selection into marriage compared to all other family states (selection effects account for between 70-75% of the initial weighted differences in total Piers-Harris scores).

Figure 11: *Estimated difference in Pier-Harris Self-Concept between children living with cohabiting parents and those living with married parents*



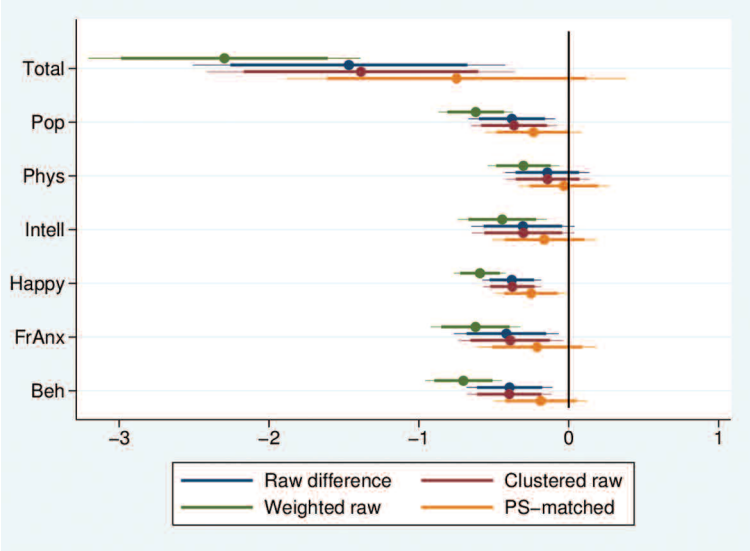
Note: Confidence intervals calculated from robust standard errors for the matched sample.

In terms of the subscales, some differences remain apparent despite taking account of selection effects. Figure 11 shows that children with cohabiting parents had a lower average score (0.35 points lower post-matching) than their married counterparts on the 'Behavioural Adjustment' subscale, indicating that they more frequently endorsed negative statements about their behaviour ('Beh' in Figure 11).

Children in never-married one-parent families had a lower average score (0.39 point lower post matching) than their married counterparts on the 'Freedom from Anxiety' subscale, indicating that they more frequently reported feelings of anxiety than children with married parents, despite taking account of selection effects ('FrAnx' in Figure 13).

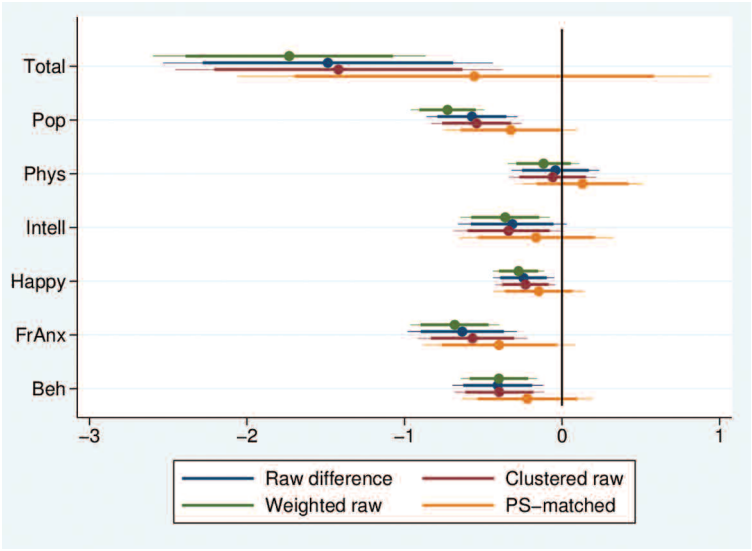
Children who had previously lived with their married parents but now live in a one-parent family had a lower average score (0.20 point lower post matching) than their married counterparts on the 'Happiness/Satisfaction' subscale, indicating they reported more negative attitudes about their happiness pre- and post-matching ('Happy' in Figure 12).

Figure 12: *Estimated differences in Pier-Harris Self-Concept between children living with previously-married lone-parents and those living with married parents*



Note: Confidence intervals calculated from robust standard errors for the matched sample.

Figure 13: *Estimated differences in Pier-Harris Self-Concept between children living with never-married lone-parents and those living with married parents*



Note: Confidence intervals calculated from robust standard errors for the matched sample.

School clustering accounts for some of the difference in total scores but it was generally a small effect (the red lines in Figures 11 to 13). The differential selection into families was a far more powerful predictor of a child's self-concept. In general, therefore, the lower total scores reported by children from less traditional family types resulted non-trivially from their pre-existing disadvantages, although some differences did remain post-matching.

4.4 Conclusions

To summarise, the largest negative effects of non-traditional family living were found in relation to educational performance (Figures 5 to 7). Despite matching, differences remained between children in non-traditional family types and their married counterparts in the key domains of educational outcomes, particularly in relation to maths scores. Unmarried motherhood has relatively larger effects in this regard. The matching results, therefore, suggest that even when faced with similarly adverse conditions when growing up, children from never-married one-parent families fare worse than children from married families, but the size of the differential would be greatly reduced if the socio-economic circumstances of these families was more similar. In general terms, the apparent advantage enjoyed by children living with married parents is largely due to the stronger socio-economic profiles of their parents, rather than marriage per se.

The matching results presented here do not take account of some limitations with the method used, in particular, the bias caused by unobserved pre-existing factors. In view of the various challenges in identifying causal pathways between aspects of family building and children's outcomes, we would hesitate to draw strong conclusions from the findings on these issues presented here.

As longitudinal data from the GUI study accumulates in future years, especially from the infant cohort, it may become possible to improve our understanding of the pathways by which family, school and neighbourhood effects matter. In the meantime, the results support the view that marriage per se is not crucially important for child wellbeing, but the background of the parents is much more important. Better educated and better resourced parents are more likely to marry and their marriages are more likely to last. In consequence, their children are more likely to grow up in such 'traditional' family contexts and enjoy numerous benefits attached to this upbringing.

Chapter 5 – Beyond Selection Effects

5.1 Limitations with Matching

In order to test the benefits of propensity score matching to adjust for selection bias, a number of other models were run. When the results from the models were compared, little difference was found between a simple regression model (including family type and incorporating all the confounding factors as explanatory variables) compared to a model which used the propensity score as a weight or post-matching estimates of treatment effects (see Figures A.1 to A.4). Overall, the propensity score matching results and the estimates from traditional regression methods tended to be quite similar. In other words, analysts who run regression models which take account of the same range of factors will find similar results to those produced here. This may be the case because regression models estimate to a fair degree the correct functional form.

In addition, however, the data was limited in terms of retrospective information. Propensity score matching results generally show that traditional regression methods overestimate the negative effects of lone-motherhood. Lee (2010) is a prime example, but the data used there was longitudinal and, therefore, included more information on pre-existing factors as the teenage mothers in the sample were interviewed before and after they gave birth (ADD Health data). The analysis presented here represents a critical bench-marking exercise to establish best practise in the field. As these children are followed over time, the benefits of such modelling should become more apparent. It would be extremely beneficial, however, if, retrospectively, more information was collected from the mothers on their backgrounds prior to the birth of the child.

A sensitivity analysis using the Rosenbaum bounds method was carried out to address the role of unobserved heterogeneity. The matching estimates become insignificant at quite low p-critical values.[16] In other words, the effect differences reported here are vulnerable to unobserved confounding variables or hidden bias. This came as no surprise given the estimated effect of school clustering in the above graphs and the similarity of effect size difference between regression and PSM models. We can, therefore, not rule out the possibility that unobserved heterogeneity underlies the relationship between family structure and child wellbeing. What follows is a description of some of the other factors which influence child outcomes which have not been addressed in this report, given its focus on selection effects and, therefore, the importance of confounding factors.

Now that the issue of selection bias has been addressed as best as we can with one wave of child cohort data, the discussion moves onto some other important and related influences on child wellbeing. The aim is to understand better the nature of any causal effect running from childhood family structure to children's wellbeing in Ireland.

5.2 School Context

The selection effects highlighted in previous chapters result in more than just differential patterns of family formation. People with poorer socio-economic resources are not only more likely to form lone-parent or cohabiting families but they are also more likely to live in certain areas and their children are more likely to attend certain types of schools. A closer examination of school differences/school context deserves attention, given the school-level differences noted in the previous chapter. What follows is an initial investigation into school-level differences. This area is one we will pursue in future research (forthcoming FSA funding).

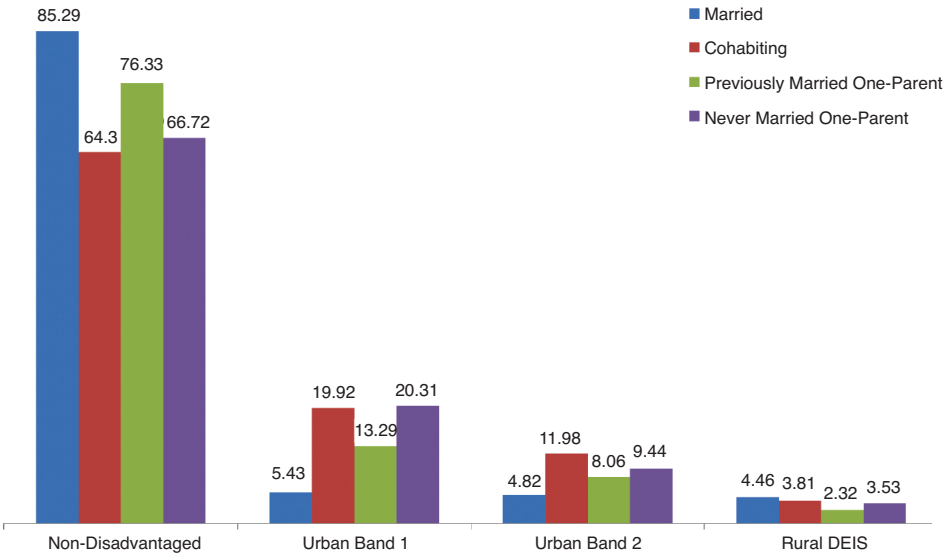
In 2005, the Delivering Equality of Opportunity in Schools programme (DEIS) in Ireland was developed and additional supports were targeted at three groups of schools (two urban and one rural). Schools were identified for inclusion based on a range of 'poverty Indicators', including prevalence of unemployment, local authority (public) housing and eligibility for the School Books Grant Scheme.

[16] These results are available from the authors on request.

In other words, DEIS school type differences are strongly related to the characteristics of the local area. Figure 14 below reports the breakdown of children attending disadvantaged status schools by family type. It distinguishes between Urban Band 1 schools (the most deprived), Urban Band 2 schools, rural DEIS schools and non-disadvantaged schools.

DEIS status schools vary strikingly in their student profiles when compared to non-disadvantaged schools (other school comparisons are also insightful but, for now, the focus is on DEIS schools). Almost all children (85%) with married parents attend a non-disadvantaged primary school compared to 76% of children with previously-married lone-mothers, 67% of children with never-married lone-mothers and 64% of children with cohabiting parents (Figure 14).

Figure 14: *Percentage of children by family type and DEIS school status*



Source: GUI child cohort RMF wave 1 (weighted data).

Urban Band 1 schools have the most varied student intake – less than half of all children in these most deprived schools are living with married parents, 15% live with cohabiting parents and over a fifth are from never-married one-parent families. This contrasts strikingly with non-disadvantaged schools where 80% of the students come from married families, 6% from cohabiting families and 1 in 10 students from never-married one-parent families.

McCoy et al (2012b) noted that these intake differences are related to a mix of factors: an interaction between residential patterns, parental choice and school admissions policies. It results in the trend that disadvantaged schools have an over-representation of children from never-married one-parent families and cohabiting families. In addition, Urban Band 1 schools emerged as the most disadvantaged in terms of socio-economic background. They are over-representative of children from families with:

- Semi-skilled, unskilled, manual labour and non-employed backgrounds
- Lower income levels
- Lower levels of maternal education
- Fewer educational resources in the home.

(Selina McCoy et al. 2012b).

A series of random-effects GLS regression models were run on the full data sample (not the matched data), taking account of the clustering of children within schools as well as controlling for the full range of confounding factors.[17] Table 8 reports the results from these preliminary models in terms of child outcome differences across family types and their significance levels. The results reflect those seen in the graphs presented in the previous chapter (however, the significance levels differ given that they are not based on the estimated propensity score). The graphs presented in the previous chapter took account

[17] Chosen based on the Hausman Specification Test. Future work in this area will use multi-level structural equation models in order to elaborate further the mechanisms by which family structure influences child development (IRC RDI 2012-2013).

of selection bias and separately presented the effects of school clustering on their own. Here, both factors are taken into account simultaneously in order to judge the size and significance of any remaining child outcome differences across family types, reporting appropriate standard errors. The intention of the modelling was, therefore, not to document or explain school-level differences in child outcomes (for example, by taking into account school-level factors such as pupil-teacher ratio, school type and resources within the classroom).

Table 8: *Estimated differences in outcomes from a series of multi-level models, taking into account the range of confounding factors (full data sample)* [18]

Reference: Married		Cohabit		S/D/W		Never married	
	Outcomes	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Educational	Maths score	-2.96	***	-2.42	***	-4.02	***
	Reading score	-2.97	***	-1.53	NS	-2.22	*
	Missed School Days	1.25	***	1.58	***	1.69	***
Physical health	BMI	0.12	NS	0.27	NS	0.21	NS
	Number of Hospital visits	-0.15	NS	0.36	NS	-0.06	NS
	Number of Dentist Visits	-0.01	NS	0.09	NS	0.04	NS
	Fruit Intake	0.00	NS	0.02	NS	0.09	*
Piers-Harris Self-Concept	Physical Appearance and Attributes	0.05	NS	-0.01	NS	0.9	NS
	Popularity	-0.16	NS	-0.20	NS	-0.28	*
	Happiness and Satisfaction	-0.17	***	-0.25	*	-0.11	NS
	Freedom from anxiety	-0.23	NA	-0.19	NA	-0.31	*
	Behavioural Adjustment	-0.40	***	-0.23	*	-0.24	*
	Intellectual/ School status	-0.46	***	-0.16	NS	-0.18	NS
	Total score	-1.09	**	-0.71	NS	-0.59	NS

*NOTE: Significant levels; *** p<0.001, **p<0.01 and * p <0.05. Each model took account of between 20-30% of the overall variance in outcomes.*

With respect to children with cohabiting parents, statistically significant differences remain in educational outcomes despite controlling for the range of confounding factors and school clustering (parameters coefficients and significance levels are reported in Table 8). Children with cohabiting parents score, on average, 3% less in maths and readings scores, controlling for a wide range of factors when compared to children with married parents. Children with cohabiting parents miss school on average one day more when compared to children with married parents, controlling for other factors (Table 8).

[18] *N* varies from model to model from 7962-8264.

Small significant effects remain in relation to some of the Piers-Harris subscales (in particular the 'Happiness and Satisfaction' subscale) but all these estimates are much smaller than the raw differences (summarised in Table 9).

For children in one-parent families, where that parent was previously married, a small number of statistically significant negative effects remained after taking school clustering and confounding factors into account (Table 8). In terms of effect size, maths scores and school attendance rates were moderately lower for these children, although the magnitude of these effects is greatly reduced compared to the raw estimates (see Table 10). In the multi-level models, children in these one-parent families still scored significantly lower on the 'Happiness and Behavioural' subscales (see Table 8).

With respect to children living with a never-married parent, statistically significant negative effects remained in relation to maths scores and attendance rates and a significant but smaller difference remained in relation to reading scores (Table 8 and Table 11). Given the evidence of unmeasured variable bias reported earlier, it is likely that the results in Table 8 still over-estimate the negative effects of non-traditional family life.

The matching and multi-level model results suggest that, even when faced with similarly adverse conditions when growing up (on a range of measured confounding variables), children from one-parent and cohabiting families fare less well in education, particularly maths tests. Children from never-married one-parent families scored over 5% less in maths when compared to their married counterparts in the matched data (Figure 6) and, even taking account of school clustering and confounding variables, they scored 4% less in the full data (Table 8).

The effects of confounding factors explained more of the variance in child outcomes between schools rather than within schools. In particular, despite controlling for all the other confounding factors, the mother's level of educational attainment had a significant effect on most aspects of the child's development. The higher the level of education of the mother, the better the wellbeing of the child, as follows:

- Higher scores in maths and reading tests
- Better school attendance
- Less likely to be overweight
- A more positive self-concept.

(This result was also noted by Fahey et al, 2012).

The birth order of the child also proved important for a number of child outcomes. Despite controlling for confounding factors, the higher the birth order of the child the more likely the child is to have:

- Lower scores in maths and reading tests
- Poorer school attendance
- More dental visits
- Lower self-concept (in particular in terms of behavioural adjustment, intellectual and school status, freedom from anxiety, and the happiness and satisfaction subscales).

Breastfeeding (despite controlling for other factors) showed significant positive effects on:

- Maths and reading test scores
- BMI levels.

Smoking during pregnancy resulted in an increased likelihood for children to have:

- Significantly lower scores in maths and reading tests
- Poorer school attendance
- Above-average BMI
- A tendency to eat slightly more fruit
- More dental visits
- A negative self-concept.

The nationality of the parent and child also had some significant effect on child outcomes. If the mother was a foreign national or didn't have English as their native language, then their child scored significantly less on the reading test. If the mother was not born in Ireland, then the study child was more likely to miss school. If the study child was not born in Ireland, they reported more negative self-concept, particularly in relation to their intellectual and school status, physical appearance and attributes, popularity and, happiness and satisfaction.

The issue with many of these selection variables is that they are related to other unmeasured factors, such as parental income. Parents who smoked during pregnancy, for instance, are more likely to come from poorer households. In addition, parents with lower levels of education, who are younger, who are non-Irish, and who have more children and were deprived themselves as teenagers are all more likely to have low levels of household income (Williams 2009). In other words, income as a measure of family wellbeing has an important effect on child wellbeing.

5.3 Income Effects

Traditionally, family wellbeing has been commonly identified with a single objective dimension i.e. material wealth, as measured by household income. Previous research has found income to be one of the most powerful predictors of child disadvantage. The income available to a family will clearly affect the circumstances and outcomes of the child. On average, a family in the study reported €19,000 as their annual income but over a third of the children were growing up in low-income families (36.3%), 29.7% in medium-income families and one-third (33.8%) in high-income families (Harris, Greene, and Merriman 2011). For the purposes of the current study, income was not a core consideration, since it was measured at the time of interview and, therefore, could not be employed as a confounding factor (as outlined in Section 2.3).

To some degree, income effects are captured in the range of confounding factors, such as educational level and family background. Income differences across families are therefore viewed as a consequence of antecedent factors rather than taken as the main explanation of the relationship between child outcomes and family structure. As outlined in Chapter 1, previous studies have shown strong income effects in terms of child development. When compared to the average income for married families:

- Cohabiting families have €3,791 less
- Previously-married lone-mothers have €5307 less
- Never-married one-parent families have over €6,000 less.

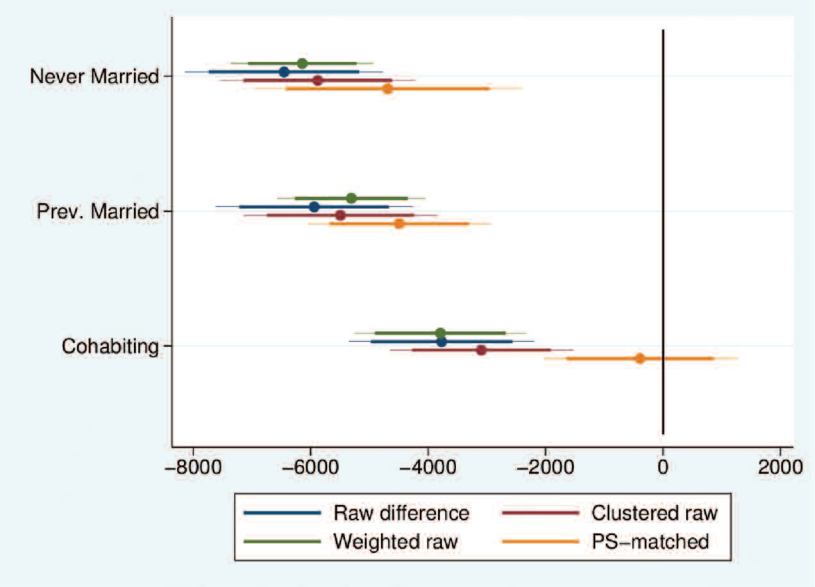
(Incomes have been adjusted to account for differences in family size and composition).[19] More generally, one-parent families are most likely to be in the lowest income quintile. Whereas widows – regardless of whether they have re-partnered or not – are more likely to be in the highest income group which is related to a number of circumstances such as their older age, higher education levels and tendency to include more lone-fathers than the other one-parent family groups (see Section 2.1). Married couples are then the next largest in terms of reported current income.

Income is, of course, an important factor in terms of child development but since it was only available at one point in time, it is employed as an outcome measure related to family wellbeing. As more data becomes available, future studies will be able to track changes in income patterns over time and how they affect child development. As a measure of family wellbeing, equivalised household income presents numerous problems since it has a high degree of missing information (N=626) and the equivalence scale is related to family structure.

[19] To make meaningful comparisons across families (re: total disposable income), we took into account household size and composition (number of adults and children) to create an equivalised family income. To do this, the GUI team calculated the number of equivalised adult members resident in the household by assigning a weight of '1' to the first adult, '0.66' to subsequent adults and '0.33' to children under 14. The total number of adult equivalents was then divided into the household's total disposable income, to give the household's equivalised income. This equivalence scale is, therefore, not independent of family structure.

Bearing these limitations in mind, Figure 15 plots the difference in equivalised household income across family types before and after matching (based on the main analysis presented in the previous chapter). Most of the raw difference in family income between cohabiting and married families was related to confounding factors. Once selection effects were taken into account, the differential in income between cohabiting families and their married counterparts was reduced to just under €400 (Figure 15). In other words, over 90% of the income difference between cohabiting and married families was related to the poorer socio-economic backgrounds of cohabiting families.

Figure 15: *Income differences across families before and after matching*



Selection bias, however, explained little of the differences in income between one-parent and two-parent families. Despite taking account of selection effects, previously-married one-parent families reported an income of €4490 less and never-married one-parent families reported an income of €4686 less than their married counterparts. In other words, differences in the educational level of mothers, their nationality and other background factors did little to explain current household income differentials.

Given the lack of state-provided childcare, it can be difficult for mothers in one-parent families to work without some family support. Previously, research has noted that grandparents contribute both income and childcare services (McNally 2010; Share and Kerrins 2009; Timonen et al. 2009). In the infant cohort of the GUI study, 12% of infants were looked after by their grandparents but this rate was higher in one-parent families (McNally 2010). One-parent families were more likely than two-parent families to receive financial support from grandparents (Williams 2009). Just under a third of one-parent families received financial support from grandparents at least once every three months (among the 3-year-old cohort). Fahey et al (2013) found that one in five lone-mothers live with grandparents and that these three-generational households are generally a positive context for the wellbeing of mothers but not necessarily for the wellbeing of the child.

On average, just over half of the mothers in the study (53%) worked, but this differed across the family types, with 44% of mothers in one-parent families employed compared to 55% in two-parent families. Mothers in one-parent families worked slightly longer hours than those in two-parent families (for example, never-married lone-mothers worked on average 28 hours per week compared to an average of 26.8 hours for married mothers).

Finally, this has implication for social welfare provision. Not surprisingly, 37% of all one-parent families claim some form of social welfare payment, this being highest amongst the widowed group, compared to 15% of married two-parent families.

Such crude differences do not capture the full picture of what is happening within these families. The social side of family life may prove equally important and this is an area untouched in this report. Like income and school effects, this area presents challenges for future work, especially when time-diary information, collected as part of the study, becomes widely available. It is expected that the work/family life balance differs across family types and may, thereby, influence child development.

5.4 Work/Family Life Balance

Income, employment status and educational levels have all been shown to impact on family wellbeing but a crucial component of wellbeing, yet to be considered, is time. How much time do families spend together and what do they do when they spend time together? Importantly, does this differ across family types and, thereby, impact child development? Work commitments outside the home may reduce the amount and quality of time available for family activities, resulting in family time being less enjoyable and more pressurised than would otherwise be the case. Issues of work-life balance affect the functioning of the family and, in particular, the amount and quality of time spent with children.

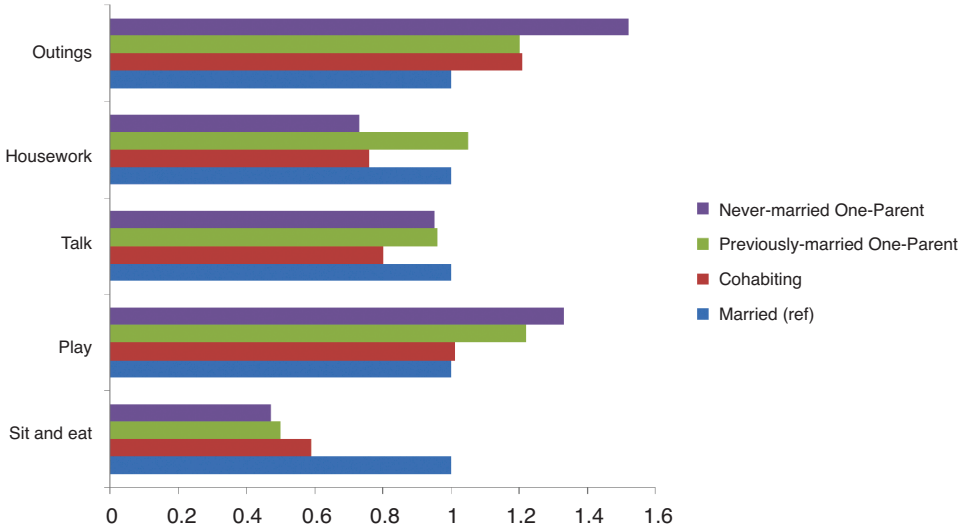
In the GUI study, the primary caregivers were asked a number of questions on how often the family do activities together. Significant differences across family types were evident regarding the range of activities but such raw comparisons do not take account of the fact that it becomes harder for parents to spend time together as a family on a daily basis if one or both parents are working. Figure 16 therefore plots family time differences across family types taking account of parental employment status and income. The married group are taken as the reference category (i.e. the odds are set to 1 for that group). One-parent families are more likely to play games together when compared to married families (Figure 16). In terms of talking about things together as a family, the only statistically significant difference was between cohabiting and married families where cohabiting families were significantly less likely to talk as a family regularly (Figure 16).

Even controlling for the fact that families with higher incomes are more likely to go on outings, all other families are more likely to go on outings together, when compared to married two-parent families (Figure 16). Never-married one-parent families are 1.5 times more likely to go on outings together than married families. There are two important components of the analysis here: first, the amount of time a family spends together and, secondly, what the family does in that time. Both could affect the child's development but, to assess that, a wide range of contextual factors need to be taken into account and much more detailed information is required on what is done with family time (this is where the time diaries come into play).

Recent evidence on this front was presented by McCoy, Quail and Smyth (2012). They found that participation in cultural activities was higher for children in two-parent families compared to one-parent families (Selina McCoy et al. 2012b). Taking account of a range of other factors, children in one-parent families were less likely to engage in a range of activities including sports, computer games and social networking. Taking account of these differences, children in one-parent families did not score significantly differently in the reading tests when compared to children from two-parent families. Similar to the findings presented in chapter 4, however, McCoy et al. found that differences in maths scores remained evident, despite taking account of a wide range of factors relating to the home, school and neighbourhood (including out-of-school activities).

The availability of the time-use data will make the examination of family time and child/family wellbeing more holistic. It will allow for an examination of family activities and the way in which such opportunities for informal learning interact with formal learning at school and vary across family types. Light time-use diaries were filled in by the mother and/or child in about 5,200 cases. William et al (2009) found little systematic significant variation in terms of the activities recorded by family type, where family type related to a simple dichotomy between two-parent versus one-parent families.

Figure 16: *Estimated odds ratios that a family spends time together on a range of activities (reference category married families)*



Source: GUI RMF child cohort controlling for employment status (full-time, part-time and unemployed) and equivalised household income.

The issue of work/family life balance and its relationship to wellbeing is a complex issue. Simple analysis, which does not look at the interplay of home, school and neighbourhood, obscures the complexity of family life. The analysis presented in this chapter is preliminary, highlighting the important roles of school, income and time-effects and pointing to areas for further research. The primary aim of this research was modest: to assess the role of selection effects in explaining differences in child outcomes across families. This chapter has introduced the broader considerations in order to further aid understanding of child development.

5.5 Summary

When we compared the wellbeing of children in non-traditional family structures to children in married two-parent families, the results are mixed:

- Modest negative effects were found with respect to education
- Smaller effects were found in relation to BMI and psychological wellbeing
- Little initial difference was evident in relation to fruit consumption or dental visits.

It appears that these benefits were not related to marriage per se but to the background characteristics of those who marry. In other words, there are strong selection effects at play which mean that those who do not marry and have children differ to those who marry and have children on a wide range of important factors. The overall results are summarised in Tables 9 to 11 in terms of the importance of selection effects in explaining effect size differentials.

Studies on the effects of family structure on child development have been concerned about possible omitted variables and selection biases that are critical to estimate the 'true' effect of family type. The propensity score matching analysis employed here is designed to shed new light on this line of research. The propensity score matching results show that the socio-economic disadvantages inherent in cohabitating and one-parent families account for a non-trivial portion of the effects of non-traditional family structures. In the matched data, children from never-married one-parent families score lower on educational outcomes at age 9 but the size of the differential is greatly reduced (see Table 11). Selection bias on unobserved covariates might be one reason why family type exerts a residual influence on some child outcomes as seen in Tables 9 to 11. This is particularly evident in relation to maths scores, where the risk of scoring poorly on this test is compounded for children in one-parent families.

This chapter has outlined some of the factors missing from the analysis, most importantly in terms of selection effects are measures of previous income, employment status and social class background. In addition, school context proves to be an important factor, most especially in terms of a child's educational development. Given the nature of the data, the current study can only speak of the effects of family type on child outcomes at one point in time. Some studies report that these children fare better in the longer-term (Lee 2010). Whether or not family structure has longer-term consequences, therefore, remains an important topic for future research using the GUI study. Longitudinal research will allow for clearer analysis of the causal mechanisms as they unfold.

The results of this research will inform and strengthen the debate on lone-parenthood. Given the growth in non-traditional family structures, The current study is motivated by the social and political importance of the issues involved. The final chapter discusses the policy implications of these findings, after summarising the main results.

Table 9: *Summary of differences in outcomes for children in cohabiting families*

	Outcomes	Difference: Unmatched	Difference: ATT*	% Change due to selection
Educational	Maths score	-9.95	-2.98	70
	Reading score	-10.29	-2.69	74
	Missed School Days	2.22	1.10	50
Physical health	BMI	0.44	0.01	98
	Number of Hospital Visits	0.65	-1.56	343
	Number of Dentist Visits	0.08	0.02	75
	Fruit Intake	0.005	-0.02	500
Psychological wellbeing	Physical Appearance and Attributes	-0.04	0.10	350
	Popularity	-0.41	-0.09	78
	Happiness and Satisfaction	-0.31	-0.20	35
	Freedom from anxiety	-0.58	-0.15	74
	Behavioural Adjustment	-0.58	-0.35	39
	Intellectual/ School status	-0.59	-0.31	47
	Total score	-1.96	-0.74	62

**Note: ATT (average treatment effect for the treated) from PSM analysis.*

Table 10: *Summary of differences in outcomes for children in previously-married one-parent families*

	Outcomes	Difference: Unmatched	Difference: ATT*	% Change due to selection
Educational	Maths score	-5.95	-3.42	42
	Reading score	-4.67	-1.64	65
	Missed School Days	2.02	1.55	23
Physical health	BMI	0.42	0.25	40
	Number of Hospital visits	1.03	0.38	63
	Number of Dentist Visits	0.14	0.09	36
	Fruit Intake	0.03	0.02	33
Psychological wellbeing	Physical Appearance and Attributes	-0.06	-0.03	50
	Popularity	-0.33	-0.24	27
	Happiness and Satisfaction	-0.31	-0.25	32
	Freedom from anxiety	-0.35	-0.21	40
	Behavioural Adjustment	-0.29	-0.19	34
	Intellectual/ School status	-0.26	-0.16	38
	Total score	-1.15	-0.75	35

** Note: ATT (average treatment effect for the treated) from PSM analysis.*

Table 11: *Summary of differences in outcomes for children in never-married one-parent families*

	Outcomes	Difference: Unmatched	Difference: ATT*	% Change due to selection
Educational	Maths score	-11.68	-5.23	55
	Reading score	-9.85	-3.03	70
	Missed School Days	2.59	1.59	39
Physical health	BMI	0.53	0.27	49
	Number of Hospital Visits	2.34	-0.13	105
	Number of Dentist Visits	0.10	0.02	80
	Fruit Intake	0.09	0.06	33
Psychological wellbeing	Physical Appearance and Attributes	-0.001	0.13	13100
	Popularity	-0.58	-0.32	45
	Happiness and Satisfaction	-0.24	-0.15	37
	Freedom from anxiety	-0.66	-0.39	39
	Behavioural Adjustment	-0.44	-0.22	50
	Intellectual/ School status	-0.31	-0.16	48
	Total score	-1.50	-0.56	63

**Note: ATT (average treatment effect for the treated) from PSM analysis.*

Chapter 6 – Conclusions and Policy Implications

6.1 Findings

Family Structure

The analysis of the 9 year old cohort allowed for families to be categorised according to their current living situations and marital status. Most families fell into the traditional model of a married couple, both in their first marriage, living with their biological children. Alternative family structures are dominated by never-married one-parent families (almost 10% of all families fell into this category). The number of divorced or separated one-parent families was much smaller (2.7% of families). Never-married cohabiting couples also accounted for a small group representing just over 4% of all families. Many of the less traditional family types are, therefore, not that common and four family types were identified for further analysis: married two-parent families, cohabiting two-parent families, never-married one-parent families and previously-married one-parent families.

The Selective Nature of Family Formation

The selection argument assessed in this report maintains that childbearing outside of marriage does not necessarily result in negative consequences for children. This is because the majority of mothers who give birth outside of a traditional married setting come from impoverished backgrounds so that the adverse consequences of childbearing may be an artefact of pre-existing socio-economic disadvantages. The report, therefore, set out to assess the ways in which these mothers – cohabiting mothers, never-married lone-mothers and previously-married lone-mothers – might differ systematically from a control group of married mothers.

The results confirm that childbearing outside of marriage occurs non-randomly. In other words, mother's age, socio-economic status and other factors mean that children do not randomly end up in certain family types.

The main findings in relation to mothers are:

- Marriage was most common among the older, more educated, and more religious mothers
- Never-married lone-mothers tend to be younger: more than half of all unmarried mothers (58.5%) were less than 25 years old when they had their child compared to only 13% of married mothers
- Cohabiting mothers also tend to be younger and have lower levels of educational attainment. They tend to be less religious and spiritual (e.g.18% stated they had no religious affiliation compared to 7% of married mothers)
- Previously-married lone-mothers have more in common with married mothers but they are less likely to be Irish citizens and to state they are Catholic when compared to married mothers.

In terms of background factors which influence child development, the main findings are:

- 13% of married mothers smoked while pregnant compared to twice that number of cohabiting or previously-married mothers and almost a third of all never-married lone-mothers smoked during pregnancy

- Rates of chronic illness prior to childbirth are higher among lone-mothers: 1 in 5 separated lone-mothers reported a history of chronic illness, compared to 1 in 20 married mothers

- Cohabiting mothers are most likely to come from impoverished backgrounds with 17% reporting that their family of origin had great difficulty making ends meet when they were 16. This compares to 13% of previously-married lone-mothers and 9% of married mothers

- The lowest propensity to breastfeed was found among never-married cohabiting parents and never-married one-parent families (one in three breastfed) compared to almost half (47%) of married mothers.

Drawing causal conclusions or making policy recommendations based on these basic comparisons is difficult. Using more sophisticated statistical methods is critical for developing policies that effectively address the consequences of growing up in non-traditional families. However, evaluating the 'true' causal effect of family structure remains an elusive goal.

The Effects of Family Structure on Child Outcomes

This report employed propensity score matching techniques to adjust for selection bias and to assess the effect of family structure on numerous outcomes in young children pertaining to health, psychological wellbeing, and educational development. Upon adjusting for selection bias, the effect of growing up in a non-traditional family appears to matter most for educational attainment. The effects, however, vary depending on the type of family the child belongs to. In summary:

- Children from cohabiting families scored, on average, 10.6% less than children with married parents but the propensity score matching estimate is a quarter of the size of this raw difference. Therefore, most of the negative effect is due to selection factors

- Children from never-married one-parent families scored almost 11% less on the maths test when compared to children with married parents. The matching estimate is far smaller (5.2%) so that, again, much of the difference is the result of pre-existing disadvantages

- School attendance shows a similar picture, with the matched estimates being far smaller than the raw difference, although the effects are still evident post-matching for all children in non-traditional family types.

In general, smaller negative effects were found in relation to the physical health and emotional wellbeing of children from non-traditional family types. The key findings are:

- In terms of BMI, children with cohabiting parents were scoring slightly higher on this index but, post-matching, there was no difference in BMI between children with cohabiting parents compared to those with married parents

- Children with previously-married lone-mothers were slightly more likely to have spent time in hospital as an inpatient compared to children from married two-parent families. Once differences in selection into these states were taken into account, no differences in rates of hospital admission were evident

- When asked about themselves, children in non-traditional family structures were more likely to report a negative self-concept – where a negative self-concept is associated with fear, apathy, anxiety and insecurity. Children from these families scored lower in this regard because of the differential selection into marriage compared to all other family states (matching estimates were 70-75% smaller than the initial weighted difference in total Piers-Harris scores).

The matching results suggest that when faced with similarly adverse conditions when growing up, children from one-parent families and cohabiting families fare similarly in most regards to children from married families. Some significant modest differences do remain, however, especially in terms of maths scores and school attendance among children from never-married one-parent families. This may, at least partly, be the result of bias caused by factors not taken into account in the analysis, as is suggested by preliminary analysis taking school clustering into account. It points to an increased risk of educational under-performance compounded for children in one-parent families while the protective factors are reinforced for children in two-parent married families.

Other Influences on Child Wellbeing

Material wealth was taken as an objective measure of family wellbeing, given that income is one of the most powerful predictors of child disadvantage – income had a significant effect on all the child outcomes in the current study. An initial analysis revealed that cohabiting families were reporting an equivalised household annual income of over €4,000 less than married families. The propensity score matching estimate is over 90% smaller so that the income differential was almost entirely related to the differing socio-economic profiles of these families.

Selection bias, however, explained little of the difference in incomes between one-parent and two-parent families. The matching estimates for previously-married one-parent families showed that they reported an income of €4,500 less than their married counterparts and never-married one-parent families reported an income of €4,700 less than their married counterparts. Material wealth does not necessarily reflect the social quality of family life.

In terms of the work/family life balance, variations were evident across all families. Despite lower income levels, for example, children from never-married one-parent families were most likely to go on regular outings together as a family.

In addition, neighbourhood/school context was found to have a significant effect on child outcomes. Disadvantaged schools have an over-representation of children from never-married one-parent families and cohabiting families. Urban Band 1 schools – the most deprived schools – have the most varied students with less than half of all children in these schools living with married parents, 15% living with cohabiting parents and over a fifth from never-married one-parent families. This contrasts strikingly with non-disadvantaged schools where 80% of the students come from married families.

6.2 Policy Implications

The current study found that the observed correlations between family structure and child outcomes largely reflects nothing more than correlated observables that affect both parents' family structure and children's development.

Simple comparisons of child outcomes by family type are misleading since, in Ireland, couples who marry are significantly different from those who remain unmarried in ways that also influence child wellbeing. Previous research has, therefore, overstated the benefits of marriage for child wellbeing. The analysis presented here contributes to a better understanding of the complex relationship between family formation and child development among the growing population of unmarried mothers with children. It also sheds light on the characteristics of parents in varying family circumstances.

While the matching approach adopted here addresses selection effects driven by differences in observable characteristics between parents, it is important to note that there remains important unobservable differences that were not taken into account, especially in relation to pre-existing factors that were not recorded in the GUI study. Therefore, we are cautious about making any definitive policy recommendations.

Therefore, the current study has implications for how we define those families and children in need of support. The results show that family structure does not have a major direct influence on child outcomes. In agreement with Fahey, a move towards a welfare system which supports families on the basis of the range of confounding factors discussed in this report – rather than the residential status of their parents – is one implication of the findings presented here (as stated in Fahey et al. 2012). The current system means that lone-mothers often display a need for income support rather than, for example, cohabiting families, who are not that different to one-parent families, particularly never-married one-parent families, on the range of confounding factors analysed here or in relation to poorer child outcomes.

Fahey et al., (2012) argue for supporting families on the basis of low income or risk of poverty rather than on family status but more long-term issues need to be addressed which relate to why these families are living on low incomes. Rather than focusing on current income differences across family types, this report's main focus has been on a wider range of socio-economic background factors which differ significantly across family types. These background factors include:

- Mother's education, citizenship, religion, age and health status
- The propensity to breastfeed
- The number of children the mother has.

Below the key factors which influence both child wellbeing and family status are highlighted.

Mother's Education

Mother's education was found to be a key influence on child development in both logit and multi-level models. The majority of never-married lone-mothers are younger and come from impoverished backgrounds, with significantly lower levels of educational attainment. Their early withdrawal from the educational system puts them at a longer-term disadvantage. Lone-parenthood in itself does not have a major direct influence on child wellbeing. Its main role is to mediate the influence of parental background, most especially mother's education, which matters more for child development than the marital status or living arrangements of parents. Thus, one way in which public policy can tackle child disadvantage is to focus on educational disadvantage in the family.

Interventions at an early stage of One-Parent Family Benefit receipt could ensure that the One-Parent Family Benefit becomes an effective tool in helping young lone-mothers back into education and into employment. A more comprehensive support approach for all women at risk of dropping out of the educational system would have wider ranging benefits. Either way, intervention at an early stage, providing both training and childcare support, would be an effective way to break the cycle of socio-economic disadvantage experienced by these young women and their children. Some initiatives already exist e.g., the Teen Parent Support Programme which supports young women and men around the country since 1999.

In more general terms, there is growing evidence that recent resource cuts have been targeted at those mothers most in need of support (Barry and Conroy 2012; Loftus 2012), for example, the policy change aimed to transfer lone-parents onto Jobseekers Allowance once their youngest child reaches 7 years of age (the current age is 14 years), thus moving to a system of compulsory attachment to the labour market by 2015. Such a policy change relies on the availability of jobs (of any nature), appropriate skills, and childcare.

Never-married lone-mothers are already at risk of living in poverty, given their (generally) earlier age at childbirth and lower levels of educational attainment. As outlined by Barry and Conroy (2012), community-based childcare services have been reduced, the early childhood supplement has been abolished, and the commitment to a year of pre-school education for all 3 to 4 year olds has been spread over two years rather than one. This latter change undermines the ability of lone-mothers to take advantage of a free pre-school place to strengthen their educational and employment prospects. Unless childcare issues are addressed, recent policy changes will do little to increase mother's educational and employment prospects.

In addition, lone-mothers who had been in a position to take-up Community Employment (CE) places and retain their One Parent Family Allowance are no longer able to do so, given the reduced level of earnings disregard. It is estimated that 70% of CE participants are lone-parents and the result is a 'staffing crisis' in, for example, childcare services in disadvantaged areas which have been heavily reliant on the CE programme (Holland 2012). It is exactly these disadvantaged areas and schools which are in need of support.

The Child's Education

Despite controlling for school context and a range of confounding factors, children from never-married one-parent families were scoring significantly lower on the maths test, even at this early age. One implication of this is the need for learning support/resource teachers within all schools to target maths skills but, particularly, supports are needed within DEIS schools because they have a higher number of children from one-parent families.

In order to break the cycle of deprivation, however, appropriate interventions are required at a young age. In central Europe, childcare is being more closely integrated into early education and there is a trend underway to guarantee young children a place in childcare or pre-school education regardless of

their parents' circumstances. This is building upon a body of evidence emphasising the important of early-intervention, particularly Melhuish's work on Sure Start centres around the UK (Melhuish, Belsky, and Barnes 2010). *The Equal Opportunities Childcare Programme* which ended in 2006 saw some much-needed improvements in childcare provision but the lack of a centralised high quality early childcare education programme is a serious social policy deficit (Department of Justice, Equality and Law 2006).

Age of Mothers

The current study found that most of the adverse consequences of unmarried motherhood on children are an artefact of the pre-existing socio-economic disadvantages of these mothers. Less educated mothers, for example, are much more likely than better educated mothers to have their first child at an early age and to enter unmarried lone-parenthood. In order to tackle this, young women at risk of early childbirth and, therefore, early withdrawal from the educational system need to be supported.

Further research is required in this area in order to understand young motherhood (under age 25), be that related to lack of contraceptive knowledge, family deprivation, and/or limited educational or employment opportunities. It is only when we can understand the decision-making processes involved, the cultural context, and the constraints facing these young women, that effective policies can be developed. The findings do point to the importance of social context in this regard, in relation to the higher proportions of children from lone-parent families attending Urban Band 1 DEIS schools and, therefore, most likely living in disadvantaged areas. Limerick City is an example of social segregation in this regard where rates of lone parenthood are particularly high (over 45%) in the large local authority housing estates of the city (Humphries 2012).

Mother's Health

The health of mothers was strongly differentiated by their marital status and influenced the wellbeing of their children. One in ten never-married lone-mothers experienced a chronic illness before the birth of their child and almost a third smoked while they were pregnant. This compares to 13% of married mothers who smoked during pregnancy and 5.6% who reported a chronic illness prior to childbirth. These health differences are important mechanisms by which the social backgrounds of mothers influence their child's wellbeing. Health differences are socially determined and the results of the current study emphasise the importance of a more holistic approach to tacking issues of child development.

Supports for One-Parent Families

It was not the aim of this project to examine the economic vulnerabilities of families or to assess the effectiveness of welfare schemes or services designed to support families. Instead, the current study has stressed the factors, other than income, that contribute to child wellbeing. However, the income differentials between one-parent and two-parent families appear large in the GUI study (section 5.3). Given the economic crisis, public expenditure directed at families has been reduced. In January 2011, and again in 2012, rates of child benefit were cut. It leaves child benefit still lower for the first and second child compared to subsequent children – an anti-poverty measure targeted at large families rather than one-parent families.

Payments for lone-parents were cut in a number of areas. First, the upper age limit of the youngest child for new claimants of the One-Parent Family Payment will be reduced to 7 years on a phased basis between now and 2014 (In 2011 it was age 14 for new claims). It was reduced to 12 years with effect from 2012. In addition, the income disregard for one-parent benefits was reduced. Further discontinuation or cuts to services designed to support families and children are likely, but policies should aim to at the least preserve supports for families and children in most need, however that need is defined.

6.3 Future Family Research

One of the key areas for future study is the relationship between family structure and educational development at the school/neighbourhood level and not just across families. Future work in this area will investigate the effects on a child of attending a DEIS school with a high concentration of one-parent and cohabiting families, taking account of local neighbourhood characteristics. The impact of family type on children's educational development should ideally be observed through the medium of schools, neighbourhoods and families over time. Key to this is the availability of longitudinal data from the GUI study, which will allow research to focus on the important interplay of family, school and neighbourhood factors over time.

Work is this area will however continue to be limited by:

- The absence of socio-economic and demographic information prior to the birth of the child (life history data)
- The large degree of missing data on some issues, such as non-residing parents
- The small number of lone-fathers in the GUI study.

In this regard, a key issue that could not be addressed in the current study was the relationship between income deprivation and non-traditional family formation. Some of the parents in the study may have been poor prior to becoming a lone-parent and some may not have been poor. The incomes and employment patterns of families prior to the birth of the child have not been collected in the current study but, as these families are followed over time, it will become possible to look at the effects of income and employment changes on child wellbeing.

The large degree of missing information on current incomes, non-residing fathers and the general relationship status of mothers including date of marriage are issues the GUI team might be wise to address in future data collection. Multiple imputation methods are becoming more common, especially in relation to missing data on income but are not advisable in relation to the larger degree of missing information from non-residing fathers. The more general social supports available to lone-mothers – such as partners not living in the same household as the mother and her children (referred to as 'living apart together' relationships) – are not documented in the data but other aspects of her support system are, such as emotional and financial supports and social supports provided by the State.

The availability of one-day time-use diary information from children and/or their mothers will allow a more detailed investigation into the relationship between family, work and wellbeing. In this regard, it is important that reliable and valid measures of both family time and family activities are developed which take account of the differing demands facing families. How children spend their time and who they spend it with may impact their physical, social, emotional and cognitive development. Recent evidence shows some variation in how children spend their time across families but little is known about how this affects their development.

On a methodological note, future work is required on how multiple treatment groups can be better handled within the propensity score matching technique. As more data becomes available, establishing best practise – in terms of handling attrition, unobserved bias, and missing data – will become increasingly important. While many datasets contain information from thousands of respondents, they sometimes fail to include enough respondents from less common family structures, such as lone-father families. Sample limitations often constrain the number and types of categories that researchers can analyse, and, for example, the current study was restricted to use more general categories that combine diverse family types. In this regard, access to full CSO census data is invaluable in terms of looking at smaller groups such as step-families and lone-father households as previously granted to Lunn et al. (2010).

Finally, an in-depth study of the decision-making processes involved in having children is missing in the Irish case. Qualitative studies of the family have become increasingly scarce, such as those carried out by Humphries (1966) or Hannan (1979). The availability of the qualitative element to the GUI study promises to provide valuable insights into current family life and increases the potential for innovative mixed methods research in this area. This all points to the importance of research training within and outside of universities in regard to establishing the quantitative skills required to analyse longitudinal data and to engage in mixed methods research using the wonderful resource which is the GUI study.

Appendix

Table A.1: *Distribution of selection variables in unmatched and matched samples (covariate balance check and absolute bias reduction)*

	Unmatched			Matched			
	Cohabiting Treatment 1	*Married Control*	*Sig.*	*Cohabiting*	*Married*	*Sig.*	*Reduction bias %*
PCG Female	0.98	0.99	*	1	1	-	-
PCG Age	35.55	40.62	*	35.45	35.34	NS	97.8
PCG Age-squared	151	267	*	148	143	NS	95.7
PCG Height	163.85	163.91	NS	163.56	163.16	NS	-
PCG Height-squared	26895	29911	NS	26798	26665	NS	-
PCG Religion: Ref No religion							
Christian	0.017	0.019	NS	0.017	0.026	NS	-
Catholic	0.78	0.87	*	0.78	0.78	NS	97.9
Anglican	0.01	0.02	***	0.007	0.009	NS	86.9
Other protestant	0.01	0.02	NS	0.01	0.02	NS	-
Jewish	0.01	0.007	NS	0.003	0.004	NS	-
Muslim	0.002	0.002	NS	0.002	0.002	NS	-
Other	0.002	0.002	NS	0.002	0	NS	-
PCS religious: Ref Not at all	2.38	2.75	*	2.35	2.47	***	67.2
PCG Education: Ref none or primary							
Lower Secondary	0.27	0.12	*	0.27	0.28	NS	93.6
Higher secondary	0.29	0.32	NS	0.29	0.28	NS	-
Non-degree	0.22	0.25	NS	0.22	0.21	NS	-
Primary degree	0.11	0.17	*	0.11	0.10	NS	78.6
Postgraduate	0.03	0.11	*	0.03	0.03	NS	100
PCG native English: Ref Yes	0.06	0.06	NS	0.06	0.10	***	-248
PCG Citizen: Ref Irish	0.09	0.08	***	0.09	0.13	***	-87.1
PCG Born Ireland: Ref Yes	0.18	0.16	NS	0.17	0.22	NS	-
SC gender: Ref Male	0.56	0.51	**	0.58	0.55	NS	44.5
SC Age: Ref 8							
Aged 9	0.98	0.98	NS	0.98	0.98	NS	-
Aged 10	0.01	0.01	NS	0.01	0.01	NS	-
SC birth weight	3.42	3.52	*	3.42	3.47	NS	57.6
SC Birth Time: Ref late birth							
On time	0.60	0.64	NS	0.60	0.60	NS	
Somewhat early	0.1	0.11	NS	0.09	0.06	***	-162.1
Very early	0.01	0.01	NS	0.01	0.01	NS	-
SC Birth mode: Ref Normal							
Suction assisted	0.08	0.07	NS	0.08	0.10	NS	-
Forceps assisted	0.05	0.06	NS	0.05	0.02	**	-142.5
Elective caesarean	0.05	0.10	*	0.05	0.05	NS	92.2
Emergency caesarean	0.09	0.10	NS	0.09	0.11	NS	-
Other	0.002	0.002	NS	0.002	0.006	NS	-
Other combined methods	0	0.001	NS	0	0	NS	-
SC NICU: Ref Yes	0.86	0.86	NS	0.87	0.86	NS	-
SC breastfed: Ref Yes	0.64	0.46	*	0.64	0.63	NS	96.8
SC born Ireland: Ref Yes	0.09	0.11	NS	0.08	0.12	NS	-
Birth order	1.67	1.98	*	1.66	1.66	NS	98.1
PCG smoked	0.58	0.22	*	0.57	0.63	NS	83.8
PCG alcohol	1.41	1.41	NS	1.41	1.39	NS	-
PCG chronic ill: Ref Yes	0.07	0.05	NS	0.08	0.07	NS	-
PCG teen deprived	3.11	3.45	*	3.11	3.04	NS	78.1
Parent in prison: Ref Yes	0.001	0.002	*	0.001	0.006	NS	36.2
N	7211						
Log likelihood	-1504 ***						

*Note: *** p<0.001, **p<0.01 and * p <0.05*

Table A.2: *Distribution of selection variables in unmatched and matched samples (covariate balance check and absolute bias reduction)*

	Unmatched			Matched			
	S/D/W one-parent Treatment 2	*Married Control*	*Sig.*	*S/D/W one-parent*	*Married*	*Sig.*	*Reduction bias %*
PCG Female	0.95	0.99	*	1	1	-	-
PCG Age	40.531	40.63	NS	40.17	40.42	NS	-
PCG Age-squared	272	267	NS	258	267	NS	-
PCG Height	164,49	163.91	NS	163.76	163.31	NS	-
PCG Height-squared	27115	26911	***	26865	26718	NS	27.8
PCG Religion: Ref No religion							
Christian	0.05	0.02	*	0.04	0.04	NS	100
Catholic	0.78	0.87	*	0.79	0.81	NS	84
Anglican	0.03	0.02	NS	0.02	0.03	NS	-
Other protestant	0.02	0.01	NS	0.02	0.01	NS	-
Jewish	0.002	0	*	0	0	NS	100
Muslim	0.01	0.01	NS	0.01	0.01	NS	-
Other	0	0.002	NS	0	0	NS	-
PCS religious: Ref Not at all	2.68	2.76	NS	2.68	2.70	NS	-
PCG Education: Ref none or primary							
Lower Secondary	0.19	0.12	*	0.18	0.20	NS	69.1
Higher secondary	0.27	0.32	***	0.28	0.28	NS	95.4
Non-degree	0.23	0.25	NS	0.24	0.24	NS	-
Primary degree	0.15	0.17	NS	0.14	0.13	NS	-
Postgraduate	0.09	0.10	NS	0.09	0.09	NS	-
PCG native English: Ref Yes	0.08	0.05	**	0.07	0.07	NS	74
PCG Citizen: Ref Irish	0.12	0.06	*	0.11	0.11	NS	91.8
PCG Born Ireland: Ref Yes	0.21	0.16	*	0.22	0.21	NS	96.3
SC gender: Ref Male	0.54	0.51	NS	0.54	0.52	NS	-
SC Age: Ref 8							
Aged 9	0.97	0.98	NS	0.97	0.97	NS	-
Aged 10	0.02	0.008	***	0.02	0.03	NS	32.9
SC birth weight	3.45	3.52	**	3.46	3.52	NS	17.1
SC Birth Time: Ref late birth							
On time	0.62	0.64	NS	0.62	0.67	NS	-
Somewhat early	0.11	0.11	NS	0.11	0.09	NS	-
Very early	0.02	0.01	NS	0.02	0.01	NS	-
SC Birth mode: Ref Normal							
Suction assisted	0.03	0.07	*	0.04	0.04	NS	86.6
Forceps assisted	0.05	0.06	NS	0.05	0.05	NS	-
Elective caesarean	0.08	0.10	NS	0.08	0.09	NS	-
Emergency caesarean	0.11	0.09	NS	0.10	0.09	NS	-
Other	0	0.002	NS	0	0	NS	-
Other combined methods	0	0.001	NS	0	0	NS	-
SC NICU: Ref Yes	0.87	0.86	NS	0.87	0.89	NS	-
SC breastfed: Ref Yes	0.49	0.46	NS	0.50	0.50	NS	-
SC born Ireland: Ref Yes	0.16	0.11	*	0.16	0.13	NS	38.3
Birth order	2.05	1.98	NS	2.07	2.12	NS	-
PCG smoked	0.49	0.22	*	0.50	0.47	NS	89.2
PCG alcohol	1.37	1.41	NS	1.38	1.34	NS	-
PCG chronic ill: Ref Yes	0.05	0.06	NS	0.05	0.05	NS	-
PCG teen deprived	3.41	3.45	NS	3.46	3.50	NS	-
Parent in prison: Ref Yes	0.01	0.002	*	0.02	0.02	NS	63.3
N	7095						
Log likelihood	-1607***						

*Note: *** p<0.001, **p<0.01 and * p <0.05*

Table A.3: *Distribution of selection variables in unmatched and matched samples (covariate balance check and absolute bias reduction)*

	Unmatched			Matched			
	Never married one-parent Treatment 3	*Married Control*	*Sig.*	*Never married one-parent*	*Married*	*Sig.*	*Reduction bias %*
PCG Female	0.96	0.99	*	1	1	-	
PCG Age	34.45	40.63	*	33.87	33.91	NS	99.2
PCG Age-squared	128	267	*	110	112	NS	98.8
PCG Height	163.94	163.91	NS	163.36	163.31	NS	
PCG Height-squared	26932	26911	NS	26737	26718	NS	
PCG Religion: Ref no religion							
Christian	0.02	0.02	NS	0.02	0.03	NS	
Catholic	0.80	0.87	*	0.81	0.79	NS	73.8
Anglican	0.01	0.02	NS	0.01	0.03	NS	
Other protestant	0.01	0.01	NS	0.01	0.01	NS	
Jewish							
Muslim	0.002	0.007	NS	0	0	NS	
Other	0.002	0.002	NS	0.002	0	NS	
PCS religious: Ref not at all	2.44	2.76	*	2.45	2.42	NS	90.6
PCG Education: Ref none or primary							
Lower secondary	0.21	0.12	*	0.21	0.23	NS	76.0
Higher secondary	0.31	0.32	NS	0.30	0.32	NS	
Non-degree	0.24	0.25	NS	0.25	0.23	NS	
Primary degree	0.09	0.17	*	0.09	0.08	NS	81.7
Postgraduate	0.06	0.10	**	0.06	0.06	NS	88.7
PCG native English: Ref Yes	0.04	0.05	NS	0.04	0.07	***	-81.9
PCG Citizen: Ref Irish	0.05	0.06	NS	0.05	0.08	NS	
PCG Born Ireland: Ref Yes	0.24	0.16	NS	0.14	0.18	NS	
SC gender: Ref Male	0.54	0.51	NS	0.55	0.57	NS	
SC Age: Ref 8							
Aged 9	0.98	0.98	NS	0.98	0.99	NS	
Aged 10	0.005	0.008	NS	0.004	0.003	NS	
SC birth weight	3.34	3.52	*	3.34	3.36	NS	86.4
SC Birth Time: Ref late birth							
On time	0.55	0.64	*	0.54	0.57	NS	59.4
Somewhat early	0.15	0.11	**	0.16	0.12	NS	-13
Very early	0.02	0.01	NS	0.02	0.01	NS	
SC Birth mode: Ref Normal							
Suction assisted	0.06	0.07	NS	0.06	0.06	NS	
Forceps assisted	0.07	0.06	NS	0.07	0.07	NS	
Elective caesarean	0.04	0.10	*	0.04	0.07	NS	56.3
Emergency caesarean	0.09	0.09	NS	0.09	0.08	NS	
Other	0.002	0.002	NS	0.002	0.002	NS	
Other combined methods	0	0.001	NS	0	0		
SC NICU: Ref Yes	0.83	0.86	NS	0.82	0.89	NS	
SC breastfed: Ref Yes	0.65	0.46	*	0.65	0.62	NS	85.6
SC born Ireland: Ref Yes	0.09	0.11	NS	0.08	0.09	NS	
Birth order	1.40	1.98	*	1.37	1.31	NS	89.7
PCG smoked	0.65	0.22	*	0.63	0.66	NS	94.6
PCG alcohol	1.37	1.41	NS	1.38	1.44	NS	
PCG chronic ill: Ref Yes	0.09	0.06	*	0.09	0.09	NS	94.0
PCG teen deprived	3.30	3.45	**	3.31	3.21	NS	37.5
Parent in prison: Ref Yes	0.04	0.002	*	0.04	0.02	NS	54.2
N	7083						
Log likelihood	-1177***						

*Note: *** p<0.001, **p<0.01 and * p <0.05*

Table A.4: *Correlation coefficients between child outcomes and income (bold coefficient P<0.05)*

	Reading	Maths	School Attendance	Income Eating	Healthy Visits	Dentist Visits	Hospital	BMI	Total Score	Behavioural Subscale	Intellectual & School Subscale	Physical Appearance Subscale	Freedom from Anxiety	Popularity Subscale	Happiness & Satisfaction Subscale
Reading	1.000														
Maths	0.622	1.000													
School Attendance	-0.073	-0.103	1.000												
Income	0.187	0.154	-0.066	1.000											
Healthy Eating	0.066	0.052	-0.033	0.077	1.000										
Dentist Visits	-0.063	-0.050	0.028	-0.106	-0.064	1.000									
Hospital Visits	-0.065	-0.053	0.076	-0.029	-0.016	-0.012	1.000								
BMI	-0.077	-0.070	0.067	-0.052	-0.046	0.036	0.018	1.000							
Total Score	0.211	0.228	-0.070	0.073	0.062	-0.073	-0.001	-0.060	1.000						
Behavioural Subscale	0.219	0.198	-0.039	0.069	0.055	-0.049	0.004	-0.023	0.709	1.000					
Intellectual & School Subscale	0.182	0.205	-0.081	0.049	0.057	-0.053	0.011	-0.043	0.835	0.557	1.000				
Physical Appearance Subscale	0.062	0.095	-0.038	0.032	0.035	-0.045	0.008	-0.047	0.732	0.313	0.648	1.000			
Freedom from Anxiety	0.185	0.204	-0.054	0.064	0.044	-0.060	-0.015	-0.055	0.794	0.444	0.538	0.444	1.000		
Popularity Subscale	0.165	0.163	-0.067	0.066	0.046	-0.054	-0.008	-0.057	0.794	0.393	0.566	0.618	0.648	1.000	
Happiness & Satisfaction Subscale	0.161	0.145	-0.035	0.057	0.032	-0.064	-0.002	-0.063	0.740	0.519	0.541	0.596	0.569	0.521	1.000

The following figures report the estimates from various analysis of one- versus two-parent families. They show the similarity in the results obtained from four different models, compared to a simple t-test of the difference in some outcomes. The models were, first, a simple regression including family type and all the confounding factors as explanatory variables. The second and third models are various forms of propensity score matching analysis with nearest neighbour 4 and 50 (no calliper applied) and, finally, a regression model using the propensity score as a weight. A subset of the full analysis is included below for information purposes. More complete analysis is available from the authors upon request.

Figure A.1: *Estimated effects on maths scores for children from one-parent families*

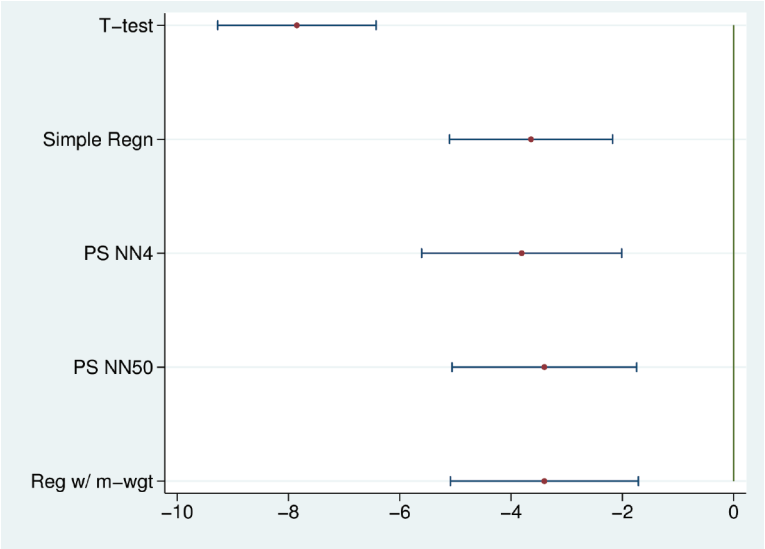


Figure A.2: *Estimated effects on reading scores for children from one-parent families*

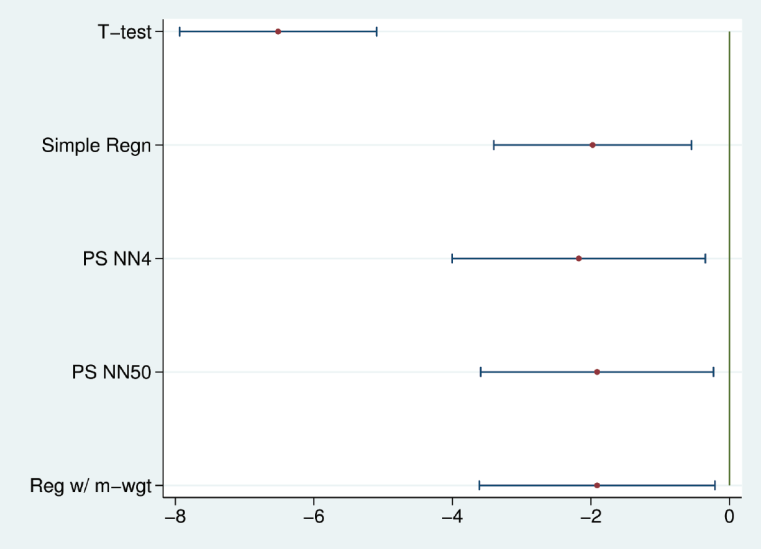


Figure A.3: *Estimated effects on BMI for children from one-parent families*

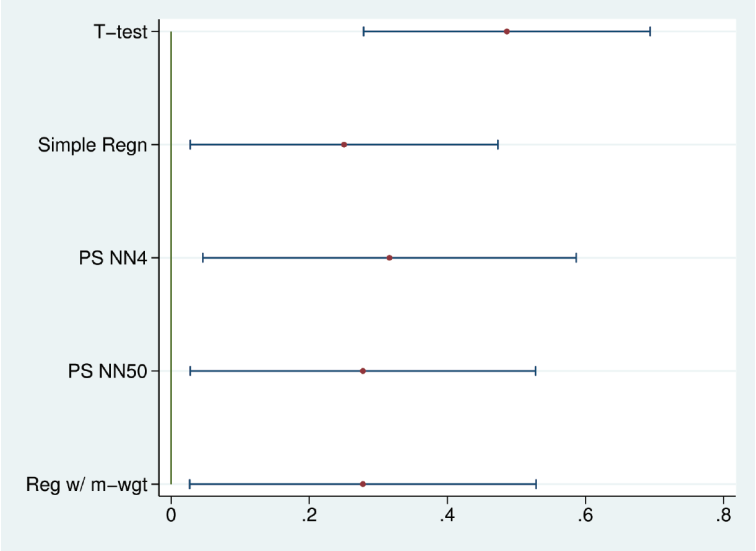
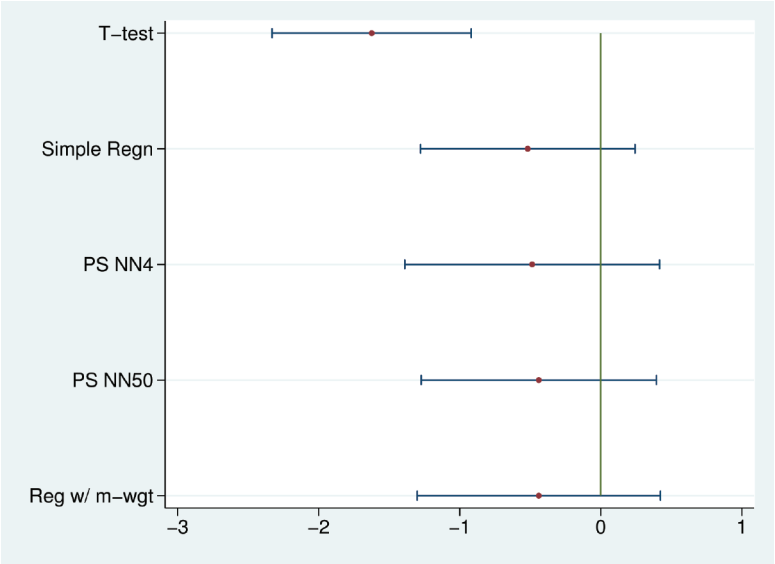


Figure A.4: *Estimated effects on Piers-Harris Total Scores for children from one-parent families*



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